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ABSTRACT

This volume includes six papers from the 1999 and 2000 Summer Data Conferences that address a variety of educational finance topics intended to promote the exchange of ideas among researchers and policymakers. After the introduction and overview by William J. Fowler, Jr., the six essays are: (1) "Evaluating School Performance: Are We Ready for Prime Time?" (Robert Bifulco and William Duncombe); (2) "Using National Data to Assess Local School District Spending on Professional Development" (Kieran M. Killeen, David H. Monk, and Margaret L. Plecki); (3) "Making Money Matter: Financing America's Schools" (Helen F. Ladd and Janet S. Hansen); (4) "Reform and Resource Allocation: National Trends and State Policies" (Jane Hannaway, Shannon McKay, and Yasser Nakib); (5) "School Finance Litigation and Property Tax Revolts: How Undermining Local Control Turns Voters Away from Public Education" (William A. Fischel); and (6) "Where Does New Money Go? Evidence from Litigation and a Lottery" (Thomas S. Dee). (RT)

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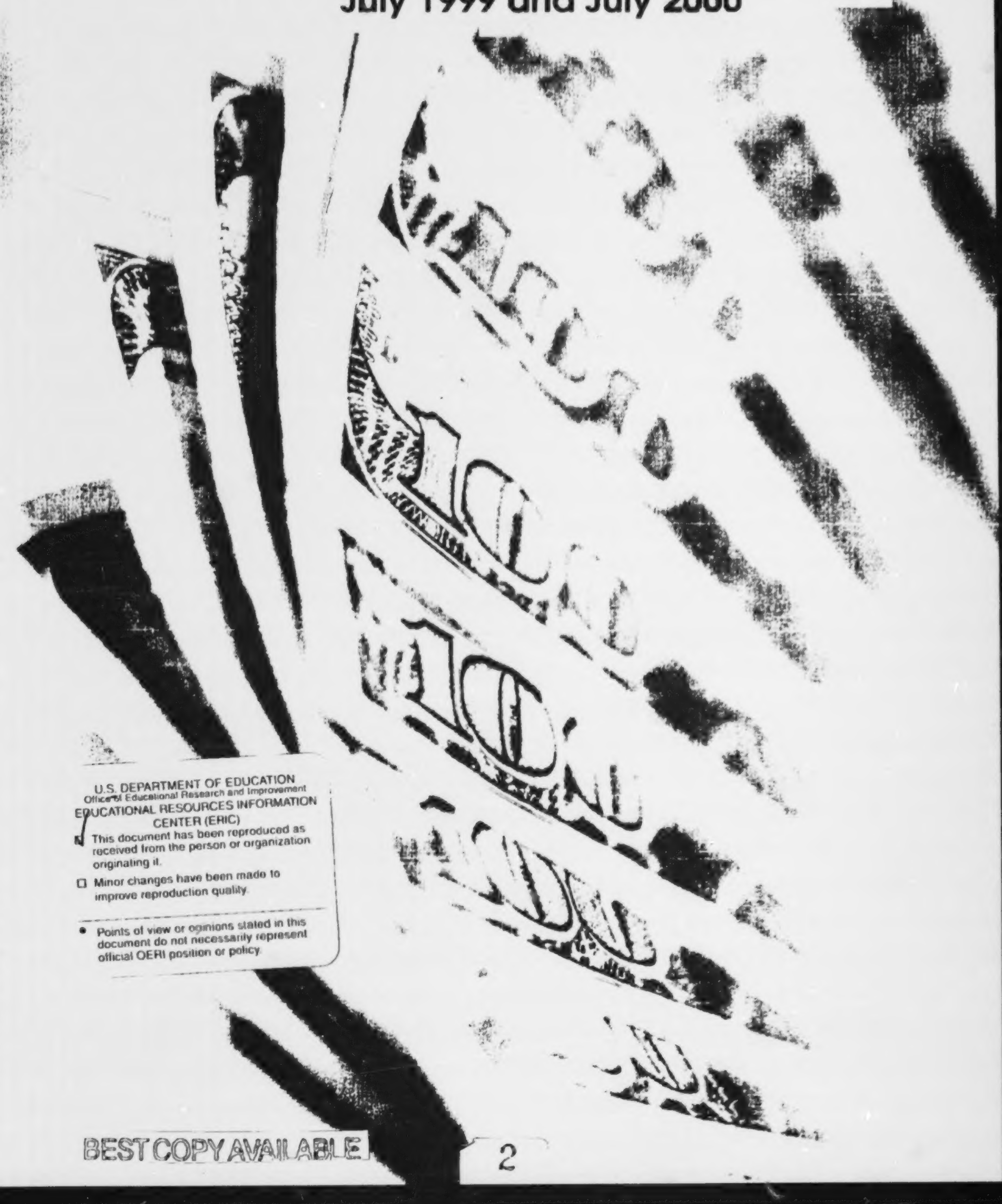

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Developments in School Finance, 1999–2000

Fiscal Proceedings from the Annual State Data Conference July 1999 and July 2000

July 2002

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National Center for Education Statistics

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Foreword

Jeffrey A. Owings, Associate Commissioner

Elementary/Secondary and Libraries Studies Division

At the 1999 National Center for Education Statistics (NCES) Summer Data Conference, scholars in the field of education finance addressed the theme, "Statistics, Technology, and Analysis for Tomorrow's Data Collections." Discussions and presentations focused on technology, data collection, and their implications on education finance reform. The theme for the 2000 Summer Data Conference was "Changing Data into Information: A Bridge to Better Policy" and focused on understanding data and survey changes, and again on their implications on education finance reform.

Developments in School Finance, 1999–2000 contains papers presented at the 1999 and 2000 annual NCES Summer Data Conferences. These Conferences attracted several state department of education policymakers, fiscal analysts, and fiscal data providers from each state, who are offered fiscal training sessions and updates on developments in the field of education finance. The presenters are experts in their respective fields, each of whom has a unique perspective or interesting quantitative or qualitative research regarding emerging issues in education finance. It is my understanding that the reaction of those who attended the Conference was overwhelmingly positive. We hope that will be your reaction as well.

This proceeding is the sixth education finance publication from NCES Summer Data Conferences. The papers included within present the views of the authors, and are intended to promote the exchange of ideas among researchers and policymakers. No official support by the U.S. Department of Education or NCES is intended or should be inferred. Nevertheless, NCES would be pleased if the papers provoke discussions, replications, replies, and refutations in future Summer Data Conferences.

Acknowledgments

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About the Editor

William J. Fowler, Jr.

National Center for Education Statistics

William J. Fowler, Jr. is the program officer of the Education Finance Program in the Elementary and Secondary Education and Library Studies Division at the National Center for Education Statistics (NCES), U.S. Department of Education. He specializes in elementary and secondary education finance and education productivity research. He is currently analyzing a fast-response survey for school business officials to obtain an understanding of how energy costs are affecting school district fiscal health. He is also engaged in research regarding kindergarten staff compensation. His great passion is designing Internet tools for the NCES education finance Web Site at http://nces.ed.gov/edfin, as well as the graphic display of quantitative data.

Dr. Fowler has worked for NCES since 1987, before which he served as a supervisor of school finance research for the New Jersey Department of Education. He has taught school finance at Bucknell University and the University of Illinois, and served as a senior research associate for the Central Education Midwestern Regional Educational Laboratory (CEMREL) in Chicago and for the New York Department of Education. He received his doctorate in education from Columbia University in 1977.

Dr. Fowler received the Outstanding Service Award of the American Education Finance Association (AEFA) in 1997, having served on its Board of Directors during the 1992–95 term, and has been re-elected for the 2001–04 term. He serves on the editorial board of the *Journal of Education Finance*, *Journal of Educational Considerations*, and the NCES *Education Statistics Quarterly*. He formerly served on the Board of Leaders of the Council for Excellence in Government, and was a 1997–98 Senior Fellow. He was a member of the Governmental Accounting Standards Board (GASB) Advisory Committee charged with developing a *User Guide for Public School District Financial Statements*.

Introduction and Overview

William J. Fowler, Jr.

National Center for Education Statistics

Education finance experts convened again in July of 1999 and July of 2000 for the annual National Center for Education Statistics (NCES) Summer Data Conference, a portion of which is devoted to presentations about public school finance. In each year, the focus of their discussions was theoretical perspectives on public school finance, the everyday policy concerns of schooling, and ongoing research studies. Each year, presenters are invited to submit papers based on the presentations made at the conference. This volume includes six papers from the 1999 and 2000 Summer Data Conferences from authors who accepted that invitation and addresses a variety of topics. They are intended to promote the exchange of ideas among researchers and policymakers. The views are those of the authors, and no official support by the U.S. Department of Education is intended or should be inferred.

The first paper analyzes the recent emphasis on performance-based accountability and asks the question: can we accurately define and measure school performance? One approach to developing school performance measures is to apply econometric and linear techniques that have been developed to measure productive efficiency. The study used simulated data to assess the adequacy of several of these methods for the purpose of performance-based school accountability. The results suggest that with the complex data sets and current technologies typical of education contexts, the most frequently used methods do not provide consistent measures of efficiency. Certainly this is an issue that Congress has recently struggled with in attempting to devise accountability measures for schools.*

The next three papers directly address education finance issues. One explores the use of national data to assess local school district spending on professional development. The authors rely on universe data from the U.S. Bureau of the Census' Survey of Local Government Finances: School District Finances (F-33). They discuss their techniques for blending the F-33 with the Common Core of Data, their use of Chambers' geographic cost adjustments (1998 version), their efforts to control for missing data, as well as choosing reporting statistics and interpreting those results into policy implications. Another paper explores the congressional mandate to the National Research Council's Committee on Education Finance to examine how education finance systems can be designed to ensure that all students achieve high levels of learning and that education funds are raised and used in the most efficient and effective manner possible. The Committee's final report focused on the new challenges facing school finance. This volume includes the executive summary from the Committee's final report. The last paper reviews the policy shifts in education in the 1990s as standards-based reforms and accountability take hold. Specific analyses include the extent to which, and the ways in which, schools and school districts have adapted to reform pressure and opportunities.

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* This assessment, based on information contained in *H.R. 1 Conference Report Highlights: Accountability for Student Achievement*, is available at http://edworkforce.house.gov/issues/107th/education/nclb/accountfact.htm.

The final two papers discuss evidence from litigation cases in various states and their effect on education finance. One paper asserts that court decisions in the Serrano tradition have undermined local support for education by creating property tax revolts, directly affecting the quality of their local schools. The other paper discusses lottery systems as revenue sources for public school finance. The author compares the results and reforms created by Georgia's lottery system to two neighboring states (Alabama and Tennessee) and their court-ordered education reforms. Specifically, the study addresses how these events influenced the size and composition of educational spending, as well as the distribution of the financial burdens.

Overall, the presentations at these conferences reiterated the age-old dilemma: what is the most effective and efficient revenue source and finance system and how are they best implemented? Let us now turn to the specifics of each paper.

In the first paper, *Evaluating School Performance: Are We Ready for Prime Time?,* **Robert Bifulco** and **William Duncombe** from the Maxwell School of Syracuse University assert that:

> There is a growing consensus that measures of school performance should be based on the student performance needs in the school. However, there is also recognition that any measure of school performance that is based on the performance of students needs to account for the differences in resources available to and service delivery environments faced by different schools.

There are a variety of econometric techniques to simultaneously consider school student performance, student needs, resources and staffing service configurations. Regardless of which quantitative technique is employed to estimate school efficiency, there are the twin questions of how accurate these estimates are, and how reliable they are. One would hope, for example, that regardless of economic method, the same schools would be identified as efficient schools. Bifulco and Duncombe use simulation to assess how accurately and reliably different econometric techniques identify efficient schools.

They are the first to acknowledge how "notoriously difficult" analysis of the education production function is. They assert that the first complication is that schools are charged not only with enhancing the cognitive development of students but also their social and emotional development, in order, for example, to promote democratic values. A second problem is the difficulty of measuring educational outputs. The use of standardized tests for cognitive attainment in particular academic subjects is problematic because such tests are not always aligned with curricular goals, and often do not assess higher-order thinking and problem solving. Then, of course, there is the major hurdle that very little is known about the factors that influence educational outputs. Even if some factors have been identified, such as teacher quality, measurement of such attributes is extremely difficult. Often, these techniques are also vulnerable to "unobserved variables," causing the mismeasurement of a school's efficiency. For example, if the activities of a teacher's union are responsible for higher teacher salaries, rather than higher teacher quality, and a measure of teacher unionism was not included in the econometric model, the resulting school efficiency score will be biased. Then, of course, there is also the dilemma that variables used by the models have simultaneous relationships. For example, poorly achieving schools may be in urban districts where their teachers are relatively inexperienced and less well educated. Finally, such environmental factors as student family background may overwhelm the school's effect on cognitive attainment.

Having acknowledged the difficulties, Bifulco and Duncombe examine six different econometric techniques for estimating school efficiency. They then conduct analyses in an attempt to determine whether these techniques are adequate for assessing school effectiveness within the context of school reform initiatives. They examine, for example, how well these econometric methodologies place schools in the lowest efficiency quintile. They found:

> In cases with endogeneity, measurement error, and a more complex production function, the best result was to place 31

> percent of the schools in the correct quintile. In these cases, at least 58 out of 200 were placed a quintile or 2 or more away from their true group. If such a method were relied on to determine financial awards or target corrective action, a large number of schools that lose out on additional resources or face burdensome requirements would have legitimate complaints. It also seems unlikely that analyzing the practices of groups identified as high or low performing by these methods would be very informative.

Bifulco and Duncombe thus conclude that the most commonly applied versions of econometric models do not provide adequate school measures of efficiency. They then suggest ways to improve efficiency measurements.

In the second paper, one of the recurrent questions in school finance is spending for the professional development of staff. **Kieran Killeen** of University of Vermont, **David H. Monk** of The Pennsylvania State University, and **Margaret L. Plecki** of the University of Washington examine this question, using NCES finance data, in part to report on the difficulties they encountered as they sought to make sense of the available data. In their paper, *Using National Data to Assess Local School District Spending on Professional Development,* they focus their attention when reviewing the literature on the data used in assessments of professional development activities. They then discuss the NCES data and the methods they employed, and their findings, and, in summary, discuss the kinds of data that are needed at the classroom, school and district level.

Killeen, Monk, and Plecki examined the extant research on teacher professional development and discovered that the most common staff professional development is conducted by school districts, rather than a college or university course. State monies for these purposes were typically controlled by the school district, and used for teacher in-service days, conferences, and workshops. The cost per regular classroom teacher in 1994 ranged between $1,755 and $3,259, using the salaries of district and school administrators, substitute teachers, and materials and supplies. Often not included in these estimates are salary increases earned by attending such in-service. A recently adopted popular strategy is to release students early on a regular basis, and have teachers engaged in professional development. This less-costly option (no teacher substitutes are needed) may have the adverse impact of reducing student instructional time.

Killeen, Monk, and Plecki used 2 years of data from the NCES Common Core of Data (CCD) and the U.S. Bureau of the Census' "Annual Survey of Local Government Finances (F-33)": 1991–92 and 1994–95. The school district finance data contain a variable, instructional staff support, which is composed of improvement of instruction services and educational media services. They found, using Chamber's 1998 geographic cost adjustment, that on average, in 1994–95, school districts spent about 2.8 percent of total expenditures on instructional staff support, or about $200 per pupil. The range was from about 2 to 8 percent. Most were between 2 and 5 percent. In per-pupil terms, spending on instructional staff support grew by 25 percent between 1992 and 1995. They found that spending increased with urbanicity.

Killeen, Monk, and Plecki conclude that the best opportunity to build a new data set exists in refinements to existing national surveys, such as the NCES Schools and Staffing Survey (SASS).

The third paper is a reprint of the executive summary of *Making Money Matter: Financing America's Schools* from the National Research Council's Committee on Education Finance, edited by **Helen F. Ladd** and **Janet S. Hansen**.

> A new emphasis on raising achievement for all students poses an important but daunting challenge for Policymakers: how to harness the education finance system to this objective....This report argues that money can and must be made to matter more than in the past if the nation is to reach its ambitious goal of improving achievement for all students.

In order to achieve this, the Committee asserts that finance decisions should be explicitly aligned with broad educational goals. Heretofore, finance policy focused primarily on the availability of revenues or disparities in spending, rather than funds needed to improve the educational system's performance. The emerging concept of funding adequacy is helpful in that it shifts the focus of finance policy from money received to how the funds are spent, with what outcomes. However, applying the adequacy concept at this stage in its infancy is an art, rather than a science, and misuse is possible. The Committee warns that political pressures may result in specifying adequacy at so low a level as to trivialize the concept, or so high that it encourages higher spending. They also maintain that making money matter more requires supplementary finance strategies, such as aligning financial incentives and performance; investing the capacity of the educational system; and empowering schools and parents.

Little is understood regarding how funds can assist schools serving concentrations of disadvantaged students to raise student outcomes. The key question that was posed to the Committee was:

> How can education finance systems be designed to ensure that all students achieve high levels of learning and that education funds are raised and used in the most efficient and effective manner possible?

The Committee transformed this question into three goals for education finance systems:

1. Education finance systems should facilitate a substantially higher level of achievement for all students, while using resources in a cost-efficient manner.
2. Education finance systems should facilitate efforts to break the nexus between student background characteristics and student achievement.
3. Education finance systems should generate revenue in a fair and efficient manner.

The Committee recognizes that the system of U.S. education is highly decentralized and diverse, with the average public school district supported almost evenly between the state and local government. Despite school finance reforms initiated about 1970, U.S. education still remains dominated by large disparities in educational spending, although there is evidence that intra-state disparities have declined, inter-state disparities may have increased. With this background, the Committee evaluates a variety of policy options employing these three strategies, and weighs the evidence on how effective they are likely to be. Finally, the report draws attention to the nation's need for better and more focused education research to help strengthen schools and bring about substantial improvements in student learning.

In the fourth paper, the question of how school district resource allocations have changed over time in response to the standards-based reforms and the accountability movement of the last decade is addressed by **Jane Hannaway** and **Shannon McKay** of the Urban Institute, with **Yasser Nakib** of George Washington University. They use the NCES Common Core of Data (CCD) school district level information in concert with the Annual Survey of Local Government Finances (F-33) to discover national trends in resource allocation patterns, and to explore whether those states that engaged in extensive reform demonstrated different resource allocations from the national pattern.

Their research was designed to evaluate whether a shift in the requirements and demands on schools in the 1990s resulted in different patterns of resource allocations. They were particularly interested in whether school districts under high performance pressure shifted resources in response to that performance pressure. As Hannaway, McKay, and Nakib discover, while finance studies over the last 30 years have concentrated on equity issues and the distribution of funds to school districts, studies of the use of resources within school districts, and especially schools, have been rare. While some longitudinal analyses have been conducted, the expenditure categories have been too highly aggregated. Hannaway, McKay, and Nakib studied regular public school districts with enrollments greater than 200 students from 1992–97. They find that, adjusted for inflation, districts increased their total current expenditures from 1992 to 1997 by 7 percent. Proportionately more (than the national average) was spent on instruction, instructional support services, and school administration. Increases on pupil personnel services, driven by special education, demonstrated the largest proportionate increases. They also find that while district administration declined during this period, school administration increased. Hannaway, McKay, and Nakib find these results surprising since, despite reform pressure, districts were only making marginal increases in instructional area spending. Special education mandates, they speculate, drove pupil support service spending, rather than standards and accountability reform.

Hannaway, McKay, and Nakib then examine four reform states: Kentucky, Maryland, North Carolina, and Texas. Each of these states had an accountability system that rewarded high achieving schools, while differing in their financial status, with Kentucky increasing its expenditure levels by over four times the national average, and

Texas by more than twice the national average, particularly in instruction. Using multivariate analysis, Hannaway, McKay, and Nakib estimate the effect of being in a high reform state on school district resource allocation. Even after controlling for region, poverty level, urbanicity, and special education populations, and the level of spending in 1992, the researchers found Kentucky and Texas still increased investment in instruction more than Maryland and North Carolina. Hannaway, McKay, and Nakib interpret this result to mean that reform alone is insufficient for reallocation.

In the fifth paper, **William A. Fischel** of Dartmouth College gives his interpretation of school finance equity litigation and what he believes are subsequent property tax revolts. His argument is that court decisions that undermine local educational funding through the local property tax disconnect local funding and the educational quality of local schools. As a result, he believes the quality of public education in the United States has probably gotten worse as a result of school finance equity litigation. Fischel has written the paper in a nonacademic manner for policymakers, rather than fellow economists.

As noted by Fischel, there remains considerable variation in spending per pupil within most states, among states, and some poor urban school districts' conditions (as noted by Jonathan Kozol in *Savage Inequalities*) that are simply intolerable. The California Supreme Court was the first to insist on statewide funding equity (in 1971), and that at least 17 other state courts subsequently also have done so. By 1978, Fischel argues, taxpayers revolted with Proposition 13. In 1973, the U.S. Supreme Court decided the use of local property taxation to finance education did not violate the equal protection clause of the U.S. Constitution. Fischel also notes that there is inequality in school district property taxes, with wealthy school districts, such as Beverly Hills, raising more than twice as much revenue per student from its property than some poor school districts, even with a tax rate half as much as the poor school districts.

Fischel advances the argument that "unequal tax rates and tax bases are not themselves indicators of unequal economic burdens." To support this notion, he introduces us to the idea of "tax capitalization." A young economist named Charles Tiebout first proposed this idea in 1956. He believed that people could indicate their preference for a public service by "voting with their feet." Families, in short, will choose the best combination of housing and public services they desire. Zoning further enforces such choices. Although some large cities do not offer such mobility choices, Fischel argues that for most people, there are scores of different school systems from which to choose. As early as 1969, Wallace Oates confirmed that the prices of homes in communities with lower taxes or better services were higher. Fischel repeated such a study in New Hampshire in 1995, including tests scores given to fourth-graders. He concludes that school tax rates and test scores are "capitalized" in the value of owner occupied housing. The higher the properties tax, the lower the value of housing. Thus, Fischel argues, property tax rates do not measure the economic burden of the property tax system. He believes it is not unfair for houses in the low-tax town to have a higher price tag. "In the high-tax town, you pay more of your money to the tax collector; in the low-tax town, you pay more of your money to the mortgage banker." He also argues that the correlation between towns with high property wealth per pupil and towns with high median family income is low, and often negative. The reason, he believes, is that nonresidential commercial and industrial property often offsets low family income. "Accidents of geography" he asserts, are few and far between.

Finally, Fischel argues that local control over educational spending produces better educational results. Although he does not assert that the local property tax should be the only method of funding schools, he wishes to warn us that government intervention should be careful not to undermine the "virtues" of the local system. Homebuyers behave as if they know about the quality of local education. Competition among public schools, Fischel asserts, raises the quality of all. He then concludes that state court decisions requiring equality and higher state revenues have contributed to tax revolts. He then reviews the evidence in Maine, New Jersey, Massachusetts, Michigan, and New Hampshire.

In the last of the papers in this volume, **Thomas S. Dee** of Swarthmore College asks where new money goes, using evidence from successful state education litigation and a lottery in Georgia, Massachusetts, and Tennessee, (3 reform states) compared to Connecticut, Maine, and South Carolina. As discussed in the previous paper, state courts in 17 states have encouraged new aid to their poorest school districts. In addition, over the last 30 years, 37 states have also sought to enhance their education revenues with new state lotteries. What Dee asks is if either of these approaches results in more education funds, and if so, where they go. In 1993, Massachusetts began court-order education finance reforms, increasing aid to poor school districts; Tennessee also did the same, and Georgia began a lottery to enhance education spending. Each state had its own unique strategy to assure that the funds enriched educational quality. Dee compares these three "reform" states with three neighboring "control" states: Connecticut, Maine, and South Carolina.

Dee explains that relative to school districts in the North, those in the South have less total revenue and receive less from local sources. He finds that real per-pupil state aid in Tennessee and Georgia increased following their 1993 reforms. However, he finds that it is difficult to untangle these increases from the recession recovery. Using regression, he finds that the reforms did increase state aid to schools in Massachusetts and Tennessee from $659 to $682 per pupil in state revenue.

In Georgia and Tennessee, school districts used their new aid to substantially reduce their outstanding debt. Approximately 53 percent of the new lottery-based revenue in Georgia went towards student instruction, while in Tennessee only 28 percent was so directed. Neither Georgia nor Tennessee's reforms, Dee finds, had the "intended consequence" of increasing school construction. However, the reforms did lead to increases in the purchases of instructional equipment.

A Final Note

Many readers are often unaware of the many conferences and training opportunities offered by the NCES in which the U.S. Department of Education pays most costs. Although there is the impression that state or local government employees may only attend these events, applications are for all those who utilize the NCES data.

The NCES routinely hosts several conferences annually. The annual Management Information Systems (MIS) conference is usually held in March of each year, and cosponsored with a state. The NCES Summer Data Conference, held in Washington, DC, usually the last week of July, is the source of the papers in this volume.

The NCES also offers training seminars that are open to advanced graduate students, researchers and policy analysts, and faculty members from colleges and universities. The 3- to 4-day seminars are usually held in the Washington, DC area, and are often specific to an NCES data set, such as the Early Childhood Longitudinal Survey (ECLS), or the Schools and Staffing Survey (SASS). Readers should check the NCES Web Site at http://nces.ed.gov/conferences/ for future conferences and training of interest.

Evaluating School Performance: Are We Ready For Prime Time?

Robert Bifulco

William Duncombe

Maxwell School of Citizenship and Public Affairs
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About the Authors

Robert Bifulco is a Ph.D. candidate in public administration at the Maxwell School of Citizenship and Public Affairs, Syracuse University, and a Research Associate at the Center for Policy Research. He has also worked for the New York State Education Department where he was involved in programs to identify and support low-performing schools.

William Duncombe is Associate Professor of Public Administration at the Maxwell School of Citizenship and Public Affairs, Syracuse University, and a Senior Research Associate at the Center for Policy Research. He has published numerous articles on school finance, the estimation of educational costs and the evaluation of educational programs.

Evaluating School Performance: Are We Ready For Prime Time?

Robert Bifulco

William Duncombe

Maxwell School of Citizenship and Public Affairs
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Introduction

Performance-based school reform has received much attention in recent years. Key elements of this reform movement include setting standards of student, teacher and school performance, granting autonomy to local actors in the educational process, and establishing rewards for high performance and remedies for low performance. These elements are prominently featured in the 1994 reauthorization of the Federal Title I program as well as several state-level reform initiatives.[1]

These reforms have been advanced as a remedy for several perceived problems with existing public education systems. Prominent among these perceived problems are a lack of the incentives and knowledge needed to improve student performance. Some have argued that given current systems for determining compensation, professional advancement and school funding, the incentives of school officials are insufficiently linked to student performance (Hanushek 1995, Levin 1997). Performance-based school reform attempts to provide stronger incentives for improving student performance by developing measures of achievement and tying financial and other rewards to those measures. Some also believe that we know very little about how to manage classrooms, schools and districts in ways that consistently result in higher levels of student achievement. By granting local actors the autonomy to experiment with new approaches and providing the means to assess the impact of local experiments on student performance, performance-based school reform is seen as a way to learn how to meet the ever-increasing demands placed on our public education systems (Hanushek 1995).

Developing valid and reliable measures of school performance is crucial both for efforts to establish incentives and to assess management practices. There is a growing consensus that measures of school performance should be based on the student performance needs in the school. However, there is also recognition that any measure of school performance that is based on the performance of students needs to account for the differences in resources available to and service delivery environments faced by different schools. One approach to developing such measures is to apply the concept of productive efficiency and techniques for measuring it, developed in the fields of economics and operations research.

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[1] For examples and analysis of state level efforts, see Richards and Sheu (1992); Elmore, Abelmann, and Fuhrman (1996); and King and Mathers (1997).

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Several such techniques have been developed, and several have been applied to estimate the efficiency of educational organizations. These include econometric approaches that utilize ordinary least squares regression and stochastic frontier estimation as well as a group of linear programming approaches falling under the rubric of Data Envelopment Analysis (DEA).[2] The availability of these methods for estimating school efficiency raises two questions. The first is whether or not the methods provide sufficiently accurate estimates of efficiency. The second question is, which method provides the most accurate estimates of efficiency and under what circumstances? Studies that have applied different methods to the same data have found that they provide different results (Banker, Conrad, and Strauss 1985; Nelson and Waldman 1986). The problem is that without knowing the true efficiency of the organizations studied, there is no way to determine which measures provide better estimates.

. . . for any given combination of school inputs, a technically efficient school could not produce more of any output (holding the other outputs constant).

Studies that use simulated data with specified, and thus known, technological relationships and levels of efficiency can help to answer these questions. A limited number of such studies have been conducted, and recently some attempts have been made to use the results of such simulation studies to assess how appropriate existing efficiency measures are for the purposes of performance-based school reform. This paper reviews existing studies and provides new evidence from an analysis using simulated data.

The body of this paper is presented in six sections. The first briefly describes the two general approaches to measuring productive efficiency used in the economic and operations research literature. The second section identifies the specific set of challenges that educational production processes pose for methods of estimating school efficiency. The third section reviews existing studies that have used simulated data to evaluate methods of estimating school performance. The fourth section identifies two different regression-based and four different DEA methods for measuring efficiency that we examine in a new simulation study. The fifth section describes how we simulated our data and the sixth section presents an analysis of how well each method did in estimating the known efficiencies of the simulated schools. The conclusion offers remarks concerning the current state-of-the-art in measuring school performance and the implications this has for performance-based school reform efforts.

Two Approaches to Measuring Productive Efficiency

Technical efficiency is defined as a feasible combination of inputs and outputs such that it is impossible to increase any output (and/or reduce any input) without simultaneously reducing another output (and/or increasing any other input). In other words, for any given combination of school inputs, a technically efficient school could not produce more of any output (holding the other outputs constant). The curve in figure 1 represents the combinations of inputs *X1* and *X2*, which if used efficiently, will produce *Y* units of output. This curve constitutes the efficient production frontier. The combination of inputs used by school 'A' to produce *Y* units of output places it off the efficient frontier. School A could produce *Y* units of output with less of either or both inputs. A measure of school A's technical efficiency can be calculated by dividing the length of ray *OB* by the length of ray *OA*. This measure represents the proportional amount of each input used by school A required to produce the level of output that it is producing. The fact that this measure is less than one indicates that school A is inefficient.

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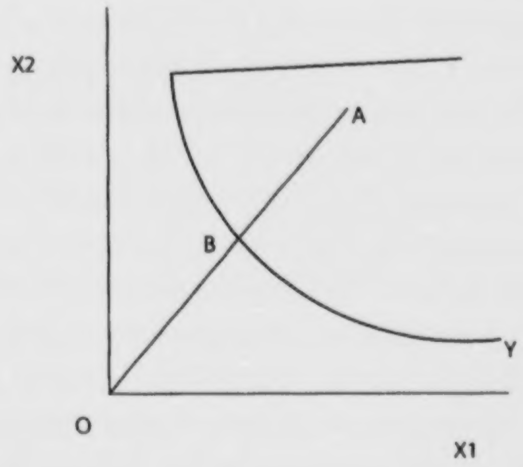
[2] Bessent and Bessent (1980) and Bessent et al. (1982, 1983) have applied the basic formulation of DEA developed by Charnes, Cooper, and Rhodes (1978) to schools in Houston. Färe, Grosskopf, and Weber (1989) have applied a version of DEA that allows for variable returns to scale to school districts in Missouri. More recently, Ray (1991); McCarty and Yaisawarng (1993); Ruggiero, Duncombe, and Miner (1995); and Kirjavainen and Loikkanen (1998) have applied DEA-based approaches that attempt to control for the different environmental factors faced by educational organizations. With regard to regression-based approaches, Barrow (1991), Deller and Rudnicki (1993), and Cooper and Cohn (1997) have applied stochastic frontier estimation methods to estimate the efficiency of districts, schools and classes. Stiefel, Schwartz, and Rubenstein (1999) have recently reviewed the various methods available for measuring school efficiency enumerating some of the advantages and disadvantages of each.

Figure 1.—Technical efficiency



Technical efficiency for firm A = OB / OA

SOURCE: Authors' sketch.

Econometric Approaches

The different methods for empirically estimating this measure of efficiency can be distinguished by the mathematical models used to estimate the efficient production frontier. Regression-based approaches begin by regressing an aggregate measure of output against a vector of inputs and a vector of environmental variables using ordinary least squares. Next, the estimated intercept term is "corrected" so that the estimated equation can be interpreted as a production frontier. The simplest of these methods, typically referred to as corrected ordinary least squares, increases the intercept term by the amount needed to make the largest residual zero. More complicated methods make use of assumptions about the probability distributions of inefficiency and random error to determine the intercept correction. Because the latter methods attempt to account for the affect of random, i.e., stochastic, factors on the observed relationships between inputs and outputs, they are said to estimate a stochastic production frontier.[3]

Implementing regression-based methods requires the assumption of an explicit functional form, explicit weights for each output and particular distributions of inefficiency and random error. The need to make assumptions that are difficult to verify is the primary disadvantage of these approaches to efficiency measurement. If the assumptions made are valid, however, the residual on the "corrected" regression equation for each school can be interpreted as a measure of inefficiency.[4]

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[3] See Bauer (1990) for a review of a number of techniques for estimating stochastic frontiers.

[4] Stiefel, Schwartz, and Rubenstein (1999) discuss alternative regression-based measures of efficiency for cases where school-level panel data are available. Repeated observations on individual schools provided by panel data allows the estimation of school fixed-effects. Stiefel, Schwartz, and Rubenstein suggest that these fixed-effects may provide a better measure efficiency than the residual from cross-sectional ordinary least squares regressions because not all of the residual variation is attributed to efficiency. As the authors point out, however, a school fixed-effect reflects all systematic variation in outputs that is not explained by observed inputs, and therefore, is likely to reflect more than just differences in efficiency. In fact, because estimation of school fixed-effects precludes inclusion of time-invariant inputs in the regression equation, the fixed-effects reflects differences in these inputs as well as the impact of factors that are typically difficult to measure and include in cross-sectional regressions. Thus, it is doubtful that this use and interpretation of panel data estimates provides improved measures of efficiency, and may even be more misleading than measures based on the residual of cross-sectional estimators.

Data Envelopment Analysis

Linear programming techniques for estimating production frontiers fall under the rubric of Data Envelopment Analysis (DEA). All DEA methods start with measures of a set of inputs and outputs for some sample of schools. They then use numerical methods to select, for each school, the set of input and output weightings that maximizes the ratio of weighted outputs to weighted inputs. This maximization problem is subject to the constraint that the weights selected for a given school, when applied to other schools in the sample do not result in one of the other schools having a ratio of weighted outputs to weighted inputs greater than one. This maximum ratio of weighted outputs to weighted inputs is the measure of efficiency. The optimization problem is run for each school separately. Thus, each school will have a different set of input and output weightings. In effect, DEA selects the set of weights that will give a particular school as high an efficiency score as possible, subject to the constraint that no other school would have an efficiency score greater than one given those weights.[5]

Analysis is further complicated by the fact that our knowledge about which factors affect educational outputs is inadequate.

DEA does not require *a priori* specification of output weights. Rather the linear programming procedure uses the data to determine relative output weightings for each school individually. Nor does it require assumptions about the functional form of the production frontier or the distribution of inefficiency. Given the uncertainty surrounding these aspects of educational production these are potentially important advantages. The primary disadvantage of DEA is that it is deterministic. That is, it attributes all deviation from the production frontier to inefficiency, and provides no means of accounting for random error.

Complications Posed by the Educational Production Process

Analysis of educational production is notoriously difficult.[6] Here, the focus is on aspects of education production that complicate the measurement of efficiency. The first difficulty is that education involves joint production of multiple outputs. Not only are schools charged with developing cognitive skills in several subject areas, but they are also charged with developing affective traits, promoting democratic values and furthering other social outcomes. Assumptions that these multiple outcomes are complimentary or even mutually consistent are difficult to maintain, and attempts to develop *a priori* weights that reflect the relative value of various outcomes are problematic. The fact that DEA does not require *a priori* specification of weights is typically touted as one of its primary advantages over regression-based approaches.

The second problem in analyzing educational production concerns the difficulty of measuring educational outputs. Standardized tests of cognitive skills are typically used to measure educational output. However, standardized tests are not always aligned with curricular goals, subjects such as science, social studies and the arts are not often tested, and even in tested subjects, higher-order thinking and problem solving skills are often not assessed (Darling-Hammond 1991). Valid and reliable measures of affective traits, democratic values and social outcomes may be even more difficult to obtain. The presence of this type of measurement error can push a school off the production frontier even if it is truly efficient or make it appear efficient when it is not. In so far as DEA attributes all deviation from the production frontier to inefficiency, its estimates of efficiency will be distorted by measurement error.

Analysis is further complicated by the fact that our knowledge about which factors affect educational outputs is inadequate. In addition, measuring factors that are known to effect educational outputs, such as student motivation or teacher quality, can be difficult. Consequently, attempts to analyze educational production suffer from the presence of unobserved inputs. Because input levels are typically correlated with each other as well as with environmental factors, the problem of unobserved variables can cause the statistical estimation of model coefficients to be biased. This is will cause regression-based techniques to misplace the production frontier, thereby biasing measures of efficiency. More generally, a school's distance from the production frontier will be determined by variation on the omitted inputs, as well as inefficiency. Failure to account for this other source of variation in a school's distance from the estimated production function will lead both DEA and regression-based approaches to provide biased estimates of efficiency.

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[5] The production frontier identified by DEA is a piecewise linear surface connecting each school that receives an efficiency rating of one. A school's efficiency score can be interpreted as its distance from this piecewise linear production frontier.

[6] For discussions of these difficulties, see Bridge, Judd, and Moock (1979) and Monk (1990).

Education production is also characterized by simultaneous relationships between inputs and outputs. In the case of certain student inputs that affect the learning process this is clear. Student motivation, for instance, both influences and is influenced by the level of educational output. Orme and Smith (1996) suggest that there may be feedback from outputs to institutional inputs as well. School districts in which test scores are low might come under pressure to promote improved performance, which might lead to increased resource provision and thus higher levels of inputs. To some extent this process is institutionalized in legislative programs. The federal Title I program, for instance, targets significant amounts of funds to schools with large numbers of students who show low levels of achievement. Such feedback is also likely to bias the estimation of regression coefficients, and Orme and Smith argue that it can bias DEA estimates of efficiency as well.

Two recent studies... suggest that simple versions of regression and linear programming approaches are inadequate.

Finally, environmental factors, such as the family background of the students served by the school, can substantially influence the level of output that schools obtain. Environmental factors are conceptually different than production inputs because they are beyond the control of school officials. If environmental factors can be represented as simple additive terms in a school's production function, then it may be acceptable to treat them as another set of inputs. In this case, environmental factors might not significantly complicate the estimation of efficiency. If, however, these factors interact with controllable inputs and technologies in nonadditive ways, then incorporating environmental factors into efficiency analysis will be complicated.

Existing Simulation Studies

There have been several studies of both regression-based and DEA methods of estimating productive efficiency.[7] Most of these are concerned with frontier and efficiency estimation generally, and do not specifically ask whether or not a given method provides measures of efficiency that are accurate enough for the purposes of performance-based school reform. Are the estimates of efficiency provided by existing methods accurate enough to serve as a basis for awarding financial incentives or targeting remedial efforts? Can these methods help us determine what managerial and resource allocation practices help to foster improved performance? Two recent studies have examined these questions and suggest that simple versions of regression and linear programming approaches are inadequate.

Brooks (2000) examines a regression-based approach for developing adjusted performance measures for schools that is similar to simple regression-based measures of efficiency used in the productivity literature. He focuses on the effect that correlation between efficiency (or in his terms "merit") and school inputs has on the accuracy of adjusted performance measures. Examining the case of one observable input and one output, he finds that an increase in the correlation between efficiency and the observed input of 0.10 decreases the rank correlation between the adjusted performance measure and the schools true merit by 0.065. He also finds that as the random error associated with the production of student performance increases, the adjusted performance measure becomes even more inaccurate. In cases where the correlation between the input and "merit" is high (above 0.50) and random error is relatively large, he finds that the rank correlation between the adjusted performance measure and true merit will most likely be statistically indistinguishable from zero. In such cases, adjusted performance measures are unlikely to provide useful rankings of schools by performance.

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[7] Aigner, Lovell, and Schmidt (1977) and Olson, Schmidt, and Waldman (1980) have used simulated data to compare different econometric methods for estimating stochastic production frontiers. Orme and Smith (1996) have published simulation studies that examine particular properties of a single DEA method; Ruggiero (1996) and Ruggiero and Bretschneider (1998) have used simulated data to compare different linear programming models. For simulation studies comparing stochastic frontier estimators and DEA, see Gong and Sickles (1992) and Banker, Gadh, and Gorr (1993).

Given what we know about the education production process, we expect correlation between inputs and efficiency of the kind examined by Brooks. Important unobserved factors, such as student and teacher motivation, are determined simultaneously with school efficiency. The more efficient a school, the higher student performance and consequently the more motivated teachers and students are to work harder, thereby improving efficiency. Also, higher levels of observed inputs, such as more teachers allowing reduced class sizes, may increase teacher and student motivation. If this is true, we can expect efficiency to be correlated with observed inputs. Thus, Brooks' findings suggest that simple regression procedures for developing efficiency measures are probably not adequate for performance-based school reform.

Bifulco and Bretschneider (2001) examine corrected ordinary least squares (COLS) and the Charnes, Cooper, and Rhodes (1978) formulation of DEA. They find that in cases with simultaneous relationships between inputs and outputs and with measurement error, the rank correlation between efficiency measures and true efficiency levels are no higher than 0.24. In these cases neither DEA nor COLS is able to place more than 31 percent of schools in the correct performance quintile. Schools assigned to the bottom 20 percent of performers are as likely to have actual performance levels above the median as in the bottom quintile. This confirms Brooks' suggestion that simple regression-based procedures provide inadequate measures of efficiency in educational contexts, and implies a similar conclusion for simple versions of DEA.

The primary advantage typically advanced for regression-based approaches is their potential for addressing measurement error by treating efficient frontiers as stochastic phenomena.

In the study presented below, we examine the accuracy of more sophisticated versions of regression-based and DEA methods for measuring efficiency. These methods are more complicated and thus more difficult to introduce into program and policy practice. However, they address some of the shortcomings of the simpler methods examined by Brooks (2000) and Bifulco and Bretschneider (2001). It is worth examining whether or not these improvements allow measures of school efficiency that are adequate for the purposes of performance-based accountability.

Methods Examined in This Study

We examine the performance of two regression-based methods of estimating efficiency and four versions of DEA. The first regression-based method we examine is COLS in which the intercept term from the ordinary least square regression is increased by the amount needed to make the largest residual zero. This is the method examined in Bifulco and Bretschneider (2001). The second regression-based method, referred to here as a stochastic frontier estimator (SFE), makes use of assumptions about the distributions of inefficiency and random error to determine the intercept correction. Details on this method are provided in Olson, Schmidt, and Waldman (1980).

The primary advantage typically advanced for regression-based approaches is their potential for addressing measurement error by treating efficient frontiers as stochastic phenomena. That is, these methods attempt to decompose the deviation of actual production from the estimated frontier into a component that is due to inefficiency and a component that is due to random error. The regression-based methods applied here, however, are not fully stochastic. The COLS method is entirely deterministic. In both adjusting the intercept and interpreting the residual from the adjusted regression equation, it is assumed that all deviation from the production frontier is due to inefficiency. The SFE method examined here uses assumptions about the distribution of inefficiency and random error in determining how much to adjust the intercept of the regression equations. Once the intercept is adjusted, however, deviations from the frontier are assumed to either be due entirely to inefficiency or entirely to random error. If an observation is on the efficient side of the frontier, all of the deviation from the frontier is assumed to be due to random measurement error. If an observation is on the inefficient side of the frontier, all of the deviation is attributed to inefficiency.[8]

The first of four DEA methods examined, referred to here as DEA I, is the input minimizing formulation of the Charnes, Cooper, and Rhodes (1978) version of DEA. Following the practice typical of early applications of DEA (Bessent and Bessent 1980; Bessent et al. 1982, 1983), only those factors over which school officials have control are included as inputs. This method, which is the one examined in Bifulco and Bretschneider (2001), has been criticized for ignoring the impact of environment on outputs (Ruggiero 1996), a particularly important issue in education.

The other three DEA-based methods examined attempt to develop estimates of efficiency that control for the influence of environment on production outcomes. One of these methods, referred to in this paper as DEA II, attempts to control for environment by including it as an input in the standard DEA linear programming problem. Although this approach fails to recognize the important conceptual distinction between environmental factors and production inputs, it may provide a practical means of accounting for the environment in DEA estimates of efficiency.

In order to examine the performance of these methods, we generated 12 different data sets that incorporate various aspects of education production discussed previously.

Another approach is a two-stage method that uses regression in an attempt to separate those parts of the DEA estimates that are due to the effect of environment on output from those parts that are due to inefficiency. In the first stage of this method, DEA I is applied, using only discretionary inputs, to develop preliminary efficiency estimates. In the second stage, these preliminary efficiency estimates are regressed on environmental variables. An adjusted efficiency estimate is then computed for each observation by multiplying the coefficients from the second stage regression by the mean value of each environmental variable, and adding this to the observed regression residual. Methods similar to this have been applied to educational organizations by Ray (1991) and by Kirjavainen and Loikkanen (1998).[9] In this paper we referred to this method as "Two-Stage DEA."

The final method we examine is that developed by Ruggiero (1996). This method modifies the standard DEA programming problem to find the minimum level of inefficiency for a given school relative to other schools that face environments no better than the one it faces. Throughout this paper we refer to this as the Ruggiero approach.

Our Data Simulations

In order to examine the performance of these methods, we generated 12 different data sets that incorporate various aspects of education production discussed previously. Each data set consists of 200 simulated observations. The relationships between inputs and outputs (i.e., the technologies) underlying each of these data sets are described here.

A Cobb-Douglas Technology with Additive Environment

The first sets of simulated data were generated from the following system of underlying technological relationships:

$$y_1 = x_1^{0.25} x_2^{0.25} n^{0.50} e^{v1-u1} \tag{1a}$$

$$y_2 = x_1^{0.20} x_2^{0.20} y_1^{0.20} n^{0.40} e^{v2-u2} \tag{1b}$$

The first output (y_1) is related by a Cobb-Douglas production function to two inputs (x_1 and x_2), an environmental factor (n), a random component representing measurement error (*v1*), and an inefficiency term (*u1*). The amount of the second output (y_2) is determined by the same two inputs, the same environmental factor, and the amount of the first output produced. The second equation also has a Cobb-Douglas form and includes its own measurement error (*v2*) and inefficiency terms (*u2*).

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[8] This interpretation of the residual is admittedly *ad hoc*. A fully stochastic approach would decompose the residual that remains after the intercept correction into an efficiency and random component, again based on *a priori* assumptions about the probability distribution of these two error components. Jondrow et al. (1982) details the procedure for this decomposition. Arguments made by Ondrich and Ruggiero (1997) demonstrate that the measures of efficiency with and without the decomposition are ordinally equivalent.

[9] Both Ray (1991) and Kirjavainen and Loikkanen (1998) use a Tobit model to estimate the second stage regression. Given that the DEA estimate is truncated at the value of one this is appropriate. The application of "Two-Stage DEA" in this paper, uses OLS to estimate a general linear regression model for the second stage. In past work done by the authors, we have found that this simplification has little effect on the resulting efficiency estimates.

We randomly generated observations for each of the inputs from a uniform distribution on the interval (90, 110). We also randomly generated observations for the environmental variable from a uniform distribution on the interval (0, 200). Given the relative degree of standardization among schools with respect to input measures such as class size, and the large differences in environmental conditions, such as student poverty, faced by different schools, we might expect substantially more variation in the environmental variable than the input variables. The coefficients on both the input and environmental factors were chosen so that the effect of environment on output levels is large relative to the impact of the discretionary inputs. Again, this is intended as a rough approximation of real life educational production.

> *The coefficients on both the input and environmental factors were chosen so that the effect of environment on output levels is large relative to the impact of the discretionary inputs.*

In each case, observations for the measurement error terms, *v1* and *v2*, were generated from a normal distribution, $N(0,\sigma_v^2)$. The value of σ_v was varied to generate three different data sets. In the first data-set, σ_v was set equal to zero to simulate a data-set with no measurement error. In the second and third cases, σ_v was set equal to 0.1 and 0.3 to simulate cases with 'small' measurement error and 'large' measurement error respectively.

The inefficiency terms, *u1* and *u2*, were each generated from a truncated normal distribution, $N(0,\sigma_u^2)$. The distribution was truncated by setting all negative values equal to zero. For both *u1* and *u2*, σ_u, was set equal to 0.3. The overall level of efficiency for each observation was calculated as follows. First, the observed values of y_1 and y_2 were computed from equations (1a) and (1b) and the randomly generated values of x_1, x_2, *n*, *v1*, *v2*, *u1*, and *u2*. Then, efficient values of *y1* and *y2* were generated for each observation by setting *u1* and *u2* equal to zero. An efficiency value was then calculated as follows:

$$Efficiency = [w_1(y1) + w_2(y2)] / [w_1(y1^*) + w_2(y2^*)] \qquad (2)$$

Where *y1* and *y2* represent observed values, *y1** and *y2** represent efficient values, and w_1 and w_2 are weights that represent the relative importance of each output. In all cases, *w1* and *w2* are both set at 0.50. The mean efficiency values for the data sets with no, small and large measurement errors were 0.891, 0.892, and 0.897, respectively.

Cobb-Douglas Technology with Additive Environment and Endogeneity

The second set of samples was generated from the same technology as was just described with one exception. The observations for x_2 were replaced by observations linked to the inefficiency terms. Specifically, we used the following to generate observations of x_2:

$$x_2 = 95 + 12u1 + 12u2 + \varepsilon \qquad (3)$$

Where ε is a normally distributed variable, *N* (0, 9). This resulted in a distribution of x_2 similar to that generated in the above described data sets, and correlations between x_2 and the efficiency value ranging from –0.679 in the case with no measurement error to –0.671 in the case with large measurement error.

A negative correlation between inputs and efficiency values can be one of the by-products of the type of feedback from outputs to inputs discussed by Orme and Smith (1996). Correlation between the general composed error terms, *u1+v1* and *v2+u2*, can also be the result of omitted variables. Thus, incorporating this correlation into the simulated data allows us to explore the impact of such feedback processes or omitted variables, i.e., endogeneity, on efficiency measurement.

Cobb-Douglas Technology with Interactive Environment

The following productive relationships were used to simulate the third group of data sets:

$$y_1 = x_1^{(0.25+0.25n)}\, x_2^{(0.25+0.25n)}\, e^{v1-u1} \qquad (4a)$$

$$y_2 = x_1^{(0.20+0.20n)} x_2^{(0.20+0.20n)} y_1^{0.20} e^{v2-u2} \tag{4b}$$

This system of equations is similar to (1a) and (1b) except that the environmental term enters into the equation nonlinearly. Here the environment affects the level of output by modifying the effect of each input. The same observations for x_1, x_2, $v1$, $v2$, $u1$, and $u2$ that were generated for the first set of samples were used for these data sets. Observations for n were randomly generated from a uniform distribution on the interval (0,1). As in the above cases, samples with no, small and large measurement error were simulated from this underlying technology. The final three samples generated incorporate endogeneity into the above technology. This is done in the same way as described above.

Taken collectively, the 12 data sets simulated for this study incorporate several important aspects of educational production such as multiple outputs, environmental factors, measurement error, and endogeneity. This will allow us to examine how these aspects of educational production affect our ability to measure school efficiency.

An important component of performance-based school reform is identification of the highest and the lowest performing schools in a jurisdiction.

Results

Our discussion of the results is divided into four sections. First, we discuss the performance of the regression-based methods. Next, we discuss the performance of the DEA-based methods. Then, we compare the performance of the regression-based approaches with the linear programming methods. Finally, we present some analysis aimed at determining whether or not the most effective regression and DEA methods are adequate for the purposes of performance-based school reform initiatives.

The Performance of Regression-Based Methods

Regression-based methods require specification of assumptions concerning the functional form of technological relationships as well as the distribution of measurement error and inefficiency. In the multiple output case, assumptions also have to be made concerning the relative weighting of the various outputs. In applying COLS and the SFE to our simulated data we specify the same set of assumptions regardless of the data set being used. In some cases, these assumptions match the specifications of the true underlying technology, and in other cases they do not. Thus, we can see how misspecification affects the performance of regression-based procedures.

More specifically, in applying both COLS and SFE, we use a Cobb-Douglas functional form with the environment entering additively. In cases where this is in fact the functional form of the underlying technology, the regression models are well-specified. However, the data sets in which the environment enters interactively with the discretionary inputs, represent cases where the regression models are misspecified. In cases with endogeneity, a different type of misspecification is introduced.

The output weights used in forming the aggregate outcome measure used in the regressions were chosen to match those used to calculate the true efficiency value. In real situations these weights might in fact differ from school to school, and in any case, are difficult to specify. By matching the weights used in applying our estimators with those used in generating the true efficiency values, we ignore this potential difficulty in applying regression-based methods. This fact should be kept in mind when evaluating their performance.

Table 1 presents Kendall-Tau rank correlation coefficients between estimated efficiencies and true efficiency values. This measure captures the ability of each method to correctly rank observations. An important component of performance-based school reform is identification of the highest and the lowest performing schools in a jurisdiction. The highest performing schools can then be rewarded and corrective actions can be targeted to the lowest performing schools. Identifying groups of high and low performing schools can also be useful for determining whether certain management or resource allocation practices consistently lead to either higher or lower levels of performance. Thus, the ability of a method to correctly rank schools is an important criterion for assessing the usefulness of the methods for the purposes of performance-based school reform. A high rank correlation suggests that the measure performs well in identifying differential efficiency.

Table 1.—Rank correlations between estimated and true efficiency values*

	COLS	SFE	DEA I	DEA II	Two stage DEA	Ruggiero approach
Cobb-Douglas technology with additive environment						
Without endogeneity						
No measurement error	0.866	0.866	0.173	0.575	0.156	0.535
Small measurement error	0.835	0.835	0.154	0.192	0.144	0.128
Large measurement error	0.596	0.596	0.095	0.071	0.085	0.103
With endogeneity						
No measurement error	0.457	0.459	0.247	0.616	0.274	0.585
Small measurement error	0.484	0.487	0.239	0.362	0.264	0.215
Large measurement error	0.380	0.399	0.273	0.302	0.285	0.244
Cobb-Douglas technology with interactive environment						
Without endogeneity						
No measurement error	0.290	0.280	0.138	0.143	0.122	0.505
Small measurement error	0.264	0.262	0.141	0.138	0.133	0.118
Large measurement error	0.259	0.255	0.108	0.087	0.090	0.095
With endogeneity						
No measurement error	0.104	0.108	0.215	0.275	0.233	0.458
Small measurement error	0.099	0.104	0.213	0.264	0.237	0.203
Large measurement error	0.076	0.090	0.260	0.306	0.281	0.233

* Correlations are Kendall Tau-b statistics.

SOURCE: Authors' sketch.

In all cases, the rank correlations for COLS and SFE are virtually identical. Both methods use the same OLS estimates to determine the production frontier slope parameters, and differ from each other only in the way they adjust the intercept to locate the production frontier. Thus, this finding is expected, and confirms similar findings by Ondrich and Ruggiero (1997). This finding suggests that although COLS might provide different cardinal measures of efficiency than SFE (and in fact does),[10] it is equivalent to SFE as an ordinal measure.[11] Thus, in situations where only the ordinal ranking of schools are required, the simpler COLS method might be preferable.

The Performance of DEA-Based Methods

As expected, DEA I provides poor estimates of efficiency in all cases. This method does not control for the influence of the environment on production outcomes and thereby confounds the affects of inefficiency with the affects of environment. Somewhat surprisingly, regressing the estimates from DEA I against the environmental variable in the "Two-Stage DEA" does not substantially improve the performance of DEA I on the rank correlation criteria. This result may be due to a misspecification of the second stage regression model. We used OLS to esti-

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[10] In results not reported here, the mean absolute difference between the true efficiency and the estimated efficiency scores were larger for SFE than for COLS in cases without measurement error, and considerably smaller for SFE than for COLS in cases with measurement error. This shows that although ordinally equivalent, the efficiency measures provided by these two methods are not cardinally equivalent.

[11] Ondrich and Ruggiero (1997) demonstrate that the ordinal measure of efficiency provided by COLS is equivalent to that provided by the fully stochastic frontier of Jondrow et al. (1982) as well.

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mate a linear regression model. However, the distribution of DEA I efficiency estimates, which provide the dependent variable in the second stage regression, is truncated at 1. Thus, a Tobit model may be more appropriate.

In cases without measurement error, DEA II and the Ruggiero approach provide improved efficiency estimates. DEA II achieves improved estimates by including the environmental variable as an input in the standard DEA program. This improves matters only in cases where environment affects production in an additive fashion. The Ruggiero approach achieves improved estimates by modifying the DEA program so that each school is compared only to schools that face an environment no better than the one it faces. The Ruggiero approach achieves improved measures of efficiency when the environment affects production in an interactive way, as well as when environment enters additively. However, the performance of both DEA II and the Ruggiero approach is substantially undermined by the presence of measurement error.

The primary advantage typically touted for regression-based approaches is that they provide a means of handling measurement error.

Comparisons of Regression-Based Methods with DEA-Based Methods

The primary advantage typically touted for regression-based approaches is that they provide a means of handling measurement error. Regression-based approaches also provide well established means of controlling for the effect of environmental factors. However, we have seen that the ordinal measures of efficiency provided by COLS and SFE are equivalent. This raises doubts about the ability of SFE to separate measurement error from inefficiency in a truly informative way. Nonetheless, in cases where the SFE model is well-specified and measurement error is present, we might expect SFE to provide more accurate estimates of efficiency than DEA.

Regression-based methods of estimating efficiency require specification of a functional form for the production function. If this is misspecified, then the regression estimates, upon which the efficiency estimates are ultimately based, will be biased. DEA on the other hand constructs a piecewise linear production frontier. This is a highly flexible functional form that can approximate most actual technologies. Thus, we would expect DEA to provide better estimates of efficiency in cases in which the functional form of the COLS model is misspecified.

Correlation between inputs and inefficiency will also bias OLS estimates of production function coefficients. Orme and Smith (1996) argue that the presence of such correlation can also bias DEA efficiency estimates. However, Bifulco and Bretschneider (2001) do not find any support for Orme and Smith's argument. Thus, we might expect the presence of endogeneity to have a larger impact on the performance of COLS and SFE efficiency estimates than DEA estimates

These expectations are by and large confirmed by the results reported in table 1. In cases where the COLS model is well-specified (i.e., the first three rows of table 1), COLS and SFE performs better than DEA on the rank correlation criteria. DEA tends to perform better in cases where the regression model is misspecified. In cases with endogeneity but no measurement error, DEA II and the Ruggiero approach both outperform COLS and SFE. When the functional form of the regression model is also misspecified (i.e., the last three rows of table 1), the Ruggiero method achieves higher rank correlations than COLS and SFE.

In cases where measurement error is present and the regression model is misspecified, both DEA and the regression-based methods perform poorly. It might be argued that these are the conditions most likely to be encountered in attempts to measure the efficiency of educational organizations. In these cases, the presence of measurement error substantially diminishes the performance of DEA, and the combination of measurement error and misspecification significantly diminishes the performance of COLS. In cases with measurement error, endogeneity and misspecified functional forms, rank correlations higher than 0.306 are never achieved, and in half of these cases rank correlations are below 0.15. It is doubtful that rank correlations of this magnitude are adequate for the purposes of awarding performance bonuses or targeting remedial resources.

Adequacy of Efficiency Estimates for Purposes of Performance-Based Reform

The results reported in table 1 raise doubts about whether our ability to estimate school efficiency is adequate for the purposes of performance-based school reform. To investigate this issue further we divided the observations in each of the 12 data sets into quintiles based on their true efficiency score. We then examined the ability of the most effective methods in the above analyses—SFE, DEA II, and the Ruggiero approach—to place observations in the appropriate quintiles. We also examined the true efficiency rankings of the schools identified by these methods as being in the lowest efficiency quintile. The results of these analyses are presented in tables 2 and 3.

The SFE method did well in cases where the underlying regression model was well-specified (see first three rows of tables 2 and 3). Particularly in cases with low measurement error, SFE assigned 74 percent of schools to the appropriate quintile and only 2 out of 200 schools were assigned to a quintile 2 or more away from their true quintile. The method also did well identifying the lowest performing schools. Of the schools assigned to the bottom quintile by SFE, 95 percent were actually in the bottom efficiency quintile and none of the schools had true efficiency values that ranked them higher in efficiency than the median.

However, the SFE method did not do as well in cases where the underlying regression model is misspecified.

Table 2.—Measures of how well various methods do in assigning observations to quintiles

	SFE		DEAII		Ruggiero approach	
	Percent assigned to correct quintile	Percent assigned two or more quintiles from actual	Percent assigned to correct quintile	Percent assigned two or more quintiles from actual	Percent assigned to correct quintile	Percent assigned two or more quintiles from actual
Cobb-Douglas technology with additive environment						
Without endogeneity						
No measurement error	80.0%	0.0%	36.0%	19.0%	34.0%	26.5%
Small measurement error	74.0	1.0	27.5	42.0	22.0	37.0
Large measurement error	49.0	11.5	20.5	43.5	21.0	38.0
With endogeneity						
No measurement error	38.5	24.0	41.5	15.5	39.0	24.5
Small measurement error	41.5	19.5	30.5	30.0	26.5	35.5
Large measurement error	34.0	28.0	32.0	29.0	26.5	36.5
Cobb-Douglas technology with interactive environment						
Without endogeneity						
No measurement error	26.5	38.5	26.5	41.0	35.0	29.5
Small measurement error	26.5	37.5	24.5	41.5	22.5	37.5
Large measurement error	28.5	38.0	20.5	45.0	22.5	37.5
With endogeneity						
No measurement error	27.5	46.0	30.5	30.0	33.5	32.0
Small measurement error	27.0	47.5	31.0	30.5	26.5	35.5
Large measurement error	24.5	46.0	31.0	29.0	25.0	36.5

SOURCE: Authors' sketch.

Table 3.—Measures of how well various measures do in identifying low efficiency schools

	SFE		DEAII		Ruggiero approach	
	Percent assigned to bottom quintile actually in bottom quintile	Percent assigned to bottom quintile actually ranked above median	Percent assigned to bottom quintile actually in bottom quintile	Percent assigned to bottom quintile actually ranked above median	Percent assigned to bottom quintile actually in bottom quintile	Percent assigned to bottom quintile actually ranked above median
Cobb-Douglas technology with additive environment						
Without endogeneity						
No measurement error	97.5%	0.0%	72.5%	0.0%	67.5%	0.0%
Small measurement error	95.0	0.0	45.0	35.0	30.0	47.5
Large measurement error	80.0	0.0	37.5	42.5	27.5	45.0
With endogeneity						
No measurement error	67.5	5.0	72.5	0.0	72.5	0.0
Small measurement error	72.5	5.0	47.5	12.5	35.0	32.5
Large measurement error	62.5	12.5	50.0	22.5	37.5	30.0
Cobb-Douglas technology with interactive environment						
Without endogeneity						
No measurement error	57.5	10.0	45.0	37.5	77.5	0.0
Small measurement error	57.5	10.0	40.0	45.0	30.0	47.5
Large measurement error	57.5	10.0	35.0	42.5	27.5	45.0
With endogeneity						
No measurement error	40.0	37.5	42.5	22.5	62.5	0.0
Small measurement error	37.5	35.0	42.5	22.5	35.0	32.5
Large measurement error	35.0	37.5	52.5	22.5	32.5	32.5

SOURCE: Authors' sketch.

In cases where the functional form is misspecified, SFE places more schools in quintiles two or more away from their true quintile than it places in the correct quintile. In cases where endogeneity is present and the SFE model is misspecified, less than half of the schools identified as being among the schools with the lowest level of efficiency are actually in the bottom efficiency quintile, and at least 14 of the 40 schools placed in the bottom quintile have true efficiency values that rank them above the median.

The two DEA methods did not do well in placing students in the correct quintile in any of the data sets. In no case did either DEA II or the Ruggiero approach place as many as half the schools in the correct quintile. In the majority of cases these methods place as many or more schools in a quintile two or more away from the true quintile as they place in the correct quintile. The DEA II and the Ruggiero approaches did reasonably well identifying low-efficiency schools, but only in the unrealistic cases where there was no measurement error.

It appears that if the underlying regression model is well-specified, then the SFE method can provide efficiency estimates that are adequate for at least some purposes. However, the past 35 years of experience in trying to analyze educational production suggest that the functional relationships between educational outcomes, school inputs and environmental factors are complex and that we know little about the forms these relationships take. Un-

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fortunately, SFE does much worse when the underlying regression model is misspecified. The DEA method has been advanced as a method of estimating efficiency that does not depend on restrictive assumptions about the form of productive relationships. However, the estimates of efficiency provided by DEA, particularly in the presence of measurement error, do not appear to be adequate.

Whether the performance of SFE when the underlying regression model is misspecified or the DEA methods in the presence of measurement error is adequate for the purposes of school-based reform is a matter of judgment. However, it is difficult to argue that the results in tables 2 and 3 are adequate. In cases with endogeneity, measurement error, and a more complex production function (i.e., the last three rows), the best result was to place 31 percent of the schools in the correct quintile. In these cases, at least 58 out of 200 schools were placed a quintile 2 or more away from their true group. If such a method were relied on to determine financial awards or target corrective action, a large number of schools that lose out on additional resources or face burdensome requirements would have legitimate complaints. It also seems unlikely that analyzing the practices of groups identified as high or low performing by these methods would be very informative. If less than half of the schools that are identified as low performing are actually inefficient, and 30 percent are actually achieving above average levels of efficiency, then it is difficult to say that the managerial practices or patterns of resource allocation found in those schools are ineffective.

The COLS and SFE methods perform well in cases where the underlying model is well-specified, particularly when measurement error is small.

Conclusions

Existing studies as well as the new evidence presented here suggest that for the complex production processes found in schools, i.e., processes characterized by complex functional forms, endogenous relationships between inputs and outputs, and substantial measurement error, the most commonly applied versions of DEA and regression-based methods do not provide adequate measures of efficiency. It would be difficult to defend implementing performance-based financing or management programs with estimates of school performance whose rank correlation with true performance is no higher than 0.30. However, our results need not be interpreted with unequivocal gloom. Not only must our findings be properly qualified, but they also suggest strategies for developing more adequate measures of efficiency.

The COLS and SFE methods perform well in cases where the underlying model is well-specified, particularly when measurement error is small. DEA also performs much better in cases without measurement error. Some forms of DEA, particularly Ruggiero's approach, also appear to be fairly robust with respect to the functional relationships between outcomes, inputs and the environment. This suggests at least three avenues for improving efficiency measurement.

First, efforts to reduce the amount of measurement error characteristic of current educational data sets are needed. Such efforts are well under way. The 1994 reauthorization of the Elementary and Secondary Education Act provided substantial amounts of funding to state educational agencies to develop testing programs that are aligned with explicit curricular goals, that test higher level thinking skills and that can be used for purposes of evaluating school performance. States, such as Kentucky, have led the way in the development of such assessment systems.[12] In addition, several city school districts, including Chicago and New York City, have developed school-based budgeting systems. These systems provide more reliable school-level resource data than has ever before been available (Rubenstein 1998; Iatarola and Stiefel 1998).

In addition to reducing measurement error, it might be possible to modify existing methods of estimating efficiency so as to minimize the effect of measurement error and/or endogeneity. For instance, the fact that the performance of COLS and SFE is diminished by correlation between inputs and inefficiency is not surprising.

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[12] See *Education Week's Quality Counts 2001* publication entitled *A Better Balance: Standards, Tests and the Tools to Succeed* for a discussion of state efforts to develop improved assessments of student performance.

This type of correlation violates the assumptions that are required if ordinary least squares is to provide unbiased coefficient estimates. Bias in these coefficient estimates is the source of the poor performance of COLS and SFE in estimating efficiency. There are, however, well known simultaneous equation methods, such as two-staged least squares, that provide unbiased coefficient estimates in cases where the assumptions of ordinary least squares are violated. If such methods could be used to estimate production frontiers, then efficiency estimates that perform better than those we have examined might be developed.

Finally, efforts to understand the functional forms that characterize educational production are needed. These efforts may be the most important for improving efficiency measurement and the most difficult to achieve. However, with continued efforts to develop theory and test those theories with more complex empirical models, we may be able to make progress on this front. The use of flexible functional forms, such as the translog production function, might also help provide more accurate estimates of efficiency by relaxing some of the restrictive assumptions about production technology made in typical regression models.[13]

In addition, we must not overlook the possibility of augmenting quantitative measures of efficiency with qualitative forms of evaluation. Such qualitative forms of evaluation might involve site visits and audits by professional peers. Research is needed to determine exactly how information acquired through such methods can be combined with existing data and methods to develop more reliable and valid measures of school performance.

Given the data that are currently available, however, our results suggest that the methods for measuring the efficiency of educational organizations that have been used most frequently may not be adequate for use in implementing performance-based management systems. This is a discouraging result, and suggests that efforts to implement performance-based school reforms should proceed with caution.

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[13] See Beattie and Taylor (1985) for details on the use of flexible functional forms in production analysis.

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Using National Data to Assess Local School District Spending on Professional Development

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Introduction

The limited progress that has been made over the years toward understanding the nature of relationships between resources and the learning gains of students is a source of great and recurring frustration for educational researchers, policymakers, and practitioners alike. Part of the difficulty can be traced to fundamental inadequacies in the data that speak to these and related issues. One of the areas where the data are particularly lacking concerns the area of spending for professional development. The limits of these data have seriously curtailed analysts' efforts to measure and assess investments in teacher professional development.

The purpose of this report is to describe procedures we used to analyze the available national data in our studies of professional development expenditures at the local school district level. We found that the ***Annual Survey of Local School District Finances*** or F-33[1] provides a rich set of school district level revenue and expenditure data. With some modification, the F-33 can provide the national perspective on a host of detailed revenue and expenditure items. Additionally, the F-33 is easily linked with other national data sets like the Common Core of Data (CCD). A closely related purpose of this study is to report on the difficulties we encountered as we sought to make sense of the available data. We have reported more detailed versions of our empirical findings elsewhere.[2] Our purpose here is to explore the data collection issues in greater detail than was possible earlier, and to provide an overview of the basic findings.

Our report is divided into four major sections. We begin with a review of the research literature dealing with spending on professional development and focus our attention on the data used in assessments of professional development activities. We turn next to a discussion about the data and the methods we employed in our work with the F-33. Finally, we summarize our general findings from two separate analyses of the F-33. In our summary and conclusion, we discuss the kinds of data that are needed at the classroom, school, and district level learning gains for pupils.

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[1] F-33 is the actual name of the survey instrument, coded by the U.S. Bureau of the Census.

[2] See Killeen, K., Monk, D., and Plecki, M. 2000. "Spending on Instructional Staff Support Among Big City School Districts: Why are Urban Districts Spending at Such High Levels?" ***Educational Considerations***. 28(1). Killeen, K., Monk, D., and Plecki, M. 1999. "School District Spending on Professional Development: Insights from National Data." A Working Paper of the Center for the Study of Teaching and Policy, University of Washington.

Current Research on Professional Development Financing

While the literature on professional development financing is not extensive, several research efforts have sought to estimate the levels of investment in teacher professional development. Most of the research on investments in professional development has addressed the source, type, and/or amount of professional development purchased (Moore and Hyde 1981; Lytle 1983; Stern, Gerritz, and Little 1989; Elmore 1997; Education Commission of the States 1997). One study found that teachers are two to three times more likely to be participants in district-provided staff development than enrolled in a college or university course (Little 1989). The same study also calculated that more than four-fifths of state dollars for staff development were controlled by the local district. Professional development activities have been dominated by a training-based delivery system, generally managed by school districts, which offers teachers a variety of workshops targeted on special projects or narrowly defined aspects of reform (Little 1993). A study by the Education Commission of the States (1997) found that approximately three-fourths of school district resources designated for professional development are spent on teacher in-service days, conferences, and workshops.

. . . teachers are two to three times more likely to be participants in district-provided staff development than enrolled in a college or university course.

Miller, Lord, and Dorney's (1994) estimates of expenditures on staff development range between 1.8 and 2.8 percent of the district's operating budget. The cost per regular classroom teacher ranged between $1,755 and $3,259. Their study was based on a series of intensive case studies in four districts located in different regions in the United States, ranging in size from 9,500 to 125,000 students. The estimates are based on direct costs such as the salaries of district and school administrators, and substitute teachers, as well as on the direct costs of materials and supplies. One detailed study of staff development in California (Little et al. 1987) estimated the investment in professional development to be almost 2 percent of total funding for education in that state. In a study of one New York school district, Elmore (1997) estimated that spending on professional development amounted to about 3 percent of the total budget. These studies do not consider, however, that most districts, due somewhat to the requirements of the bargained contracts with teachers, compensate teachers for staff development activities through an increase in salary, thus representing a "hidden" cost of traditionally delivered staff development. For example, a study of spending on professional development in the Los Angeles Unified School District (Ross 1994) found that the district expended $1,153 million in teacher salaries in 1991–92, and that 22 percent of this figure could be attributed to salary point credits that were earned because of courses or other approved professional development activities on the part of teachers.

As the example of investing in professional development through salary increments implies, there is a pronounced difficulty in fully accounting for all staff development costs. Professional development activities frequently are financed through a combination of revenue sources, including nongovernmental sources, thereby complicating the cost accounting. Professional development experiences also might be associated with substantial contributions of volunteer time on the part of teachers (Little et al. 1987). At the same time, teachers might accrue additional credits for professional development activities, which advance them on the salary schedule, resulting in a long-term fiscal obligation to the district in the form of the resultant base salary increase. Finally, similar professional development activities might vary significantly in costs per teacher depending on the financing strategy that is employed. For example, one strategy for supporting teacher professional development that is increasing in popularity is the "early release" option in which students are released from school on some regular basis, thereby allowing time during regular school hours for teachers to engage in professional development. This option clearly is less costly for school districts, as it removes the additional costs of substitutes or additional hours worked by teachers. However, there is a significant opportunity cost borne by students in the form of reduced instructional time.

The studies of professional development costs briefly reviewed above concentrate on the more traditional forms of professional development delivery. However, significant changes have been taking place in recent years regarding the conceptualization of effective teacher professional development (Little 1993; Guskey 1995; Smylie 1995; Hawley and Valli 1998; Corcoran 1995), resulting in significant rethinking of how professional development is best provided (National Foundation for the Improvement of Education 1996; Darling-Hammond and Ball 1997). This reconceptualization of professional development presents a number of conceptual and technical challenges for cost studies, including methods for assigning costs to professional development activities that are integrated into the instructional day and/or more informal interactions among teachers (Rice 1999).

It is likely that the desire of policymakers and researchers to obtain information regarding appropriate investment levels in teacher professional development will continue to grow. Consequently, research in this area will need to focus increased attention on the development of new conceptual frameworks and cost analyses which can appropriately consider the full array of delivery systems and approaches to providing teacher professional development.

In our analyses, therefore, we decided to focus exclusively on one expenditure account that we believe encapsulates general spending on professional development.

Data and Methods

Our two national studies of district-level spending on professional development relied heavily on two publicly available data sets: (1) the U.S. Bureau of the Census' *Survey of Local Government Finances: School District Finances* (F-33), a school district fiscal report compiled by the U.S. Bureau of the Census; and (2) the Common Core of Data, which is compiled by the National Center for Education Statistics (NCES) and which includes detailed organizational and demographic data on U.S. school districts. We focused on two universe years of data: 1991–92 and 1994–95.

The F-33 report includes general revenue and expenditure data along popular fiscal categories like revenue from property taxes, sales taxes, and a range of user charges, as well as current spending on instruction, salaries and capital accounts. We had hoped to make use of the detailed revenue data at the federal and state levels, but quickly discovered that it is difficult to separate out parts of the various revenue streams by school district. One may identify programs like Title I and Eisenhower grants, but it is not possible to identify the portion of each grant that is earmarked for professional development activities. In our analyses, therefore, we decided to focus exclusively on one expenditure account that we believe encapsulates general spending on professional development. In particular, we have focused on a data element called: "Instructional Staff Support," which is defined by the U.S. Bureau of the Census to include:

> Supervision of instruction service improvements, curriculum development, instructional staff training, and media, library, audiovisual, television, and computer-assisted instruction services.

Ideally, we would have liked to disentangle this expenditure item and separate spending by professional development from elements of instructional staff support. Our goal was to be as precise as possible in the measurement and analysis of the investments of professional development resources into school district staffs. The broadness of the measure is a shortcoming and warrants caution when making comparisons with other more narrowly focused indicators.

As we worked more closely with the F-33 data and developed our analytical strategy, we encountered a significant number of data issues. The U.S. Bureau of the Census as well as the NCES face formidable problems as they seek to gather information in a comparable form from each of the states and territories in the nation. There is a tendency for inconsistencies and surprises to enter the data, and analysts must be on guard for unexpected results that require special interpretation. Moreover, the collection is so vast that it is unreasonable to expect the collectors to understand and anticipate all of the questions that may be raised by a given researcher with a particular set of interests. The best way to improve these collections is for them to be put to use and for the researchers to report back on their experiences at making sense of the data. Some important efforts along these lines have been made, perhaps most notably by O'Leary and Moskowitz (1995). We seek to contribute to this tradition, and for this reason devote a significant amount of attention in our paper to data issues and our responses. We do this in the hope of stimulating the interest of other researchers in making use of an important data collection.

Using National Survey Data for Local Analysis

There are two national data sets commonly used for fiscal studies at the school district level. *The Annual Survey of Local Government Finances: Public Elementary/Secondary Education Finance Data*, conducted by the U.S. Bureau of the Census, offers the richest source of school district level fiscal data. This survey reports detailed revenue and expenditure information by function for more than 16,000 U.S. school districts. The F-33, as it is commonly called, is one of a battery of local government fiscal surveys. The *Annual Survey of Local Governments* conducted by the U.S. Bureau of the Census accounts for the fiscal environments of roughly 85,000 counties, cities, townships, special districts, and school districts, the five main local government types categorized by the U.S. Bureau of the Census. A nationally representative sample frame is used to determine fiscal conditions around the United States. As part of the Census of Governments, the U.S. Bureau of the Census conducts a complete fiscal census of all local governments in years ending with 2 and 7, which includes school districts.[3] The F-33 is slightly unique in that universe years have been collected in years when only a sample frame is used to survey other local governments. Even when sampling is used to complete the F-33, most states are fully reported and sampling is employed in a minority of states. In 1992, the data content for the F-33 was significantly expanded. Universe years for the F-33 are currently available for 1994–95 and 1995–96.

Of the nine items identified under expenditures for school district support services in the F-33, one variable identifies total expenditures for instructional staff support.

The U.S. Department of Education also collects some fiscal data as part of the annual Common Core of Data (CCD) surveys. The CCD offers a comprehensive database on all schools and school districts regarding contact information, staffing counts, enrollment counts and basic fiscal conditions. The data are not reported via a survey, like the F-33, but rather through contact with state education departments. The CCD serves as the main database for selecting national sample frames for smaller, more detailed surveys conducted by the federal government. While not widely used, some fiscal data covering revenue and expenditures of federal dollars at the school district level are also collected under the General Education Provisions Act, known as the GEPA data files. Due to diligence on the part of survey designers, the F-33 and CCD database files may be joined together through one of three unique school district identifier codes: The NCES ID Code, the U.S. Bureau of the Census Local Agency Code, and the State Government ID Code.

Fiscal Data on Staff Development Expenditures

The F-33 contains district level information about what the U.S. Bureau of the Census calls "instructional staff support services." Of the nine items identified under expenditures for school district support services in the F-33, one variable identifies total expenditures for instructional staff support (variable name = E07). As we noted earlier, "instructional staff support" is defined as those expenditures that include supervision of instruction service improvements, curriculum development, instructional staff training, and media, library, audiovisual, television, and computer assisted instruction services. According to definitions in the NCES *Financial Accounting for Local and State School Systems, 1990* (Fowler 1997), instructional staff support is composed of two main categories: improvement of instruction services and educational media services. The former clearly encapsulates an intuitive conception of expenditures for teacher support services or staff development. Items for this section include:

- Activities concerned with directing, managing, and supervising the improvement of instructional services.
- Activities that assist instructors in designing curriculum, using special curriculum materials, and

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[3] This is typical of most fiscal surveys of local government. But, universe data is available for the F-33 for 1994–95, 1995–96, and 1996–97.

learning of techniques to stimulate and motivate students.

- Activities that involve improving the occupational health or professional training of instructional staff, including expenditures for workshops, demonstrations, school visits courses for college credit, sabbatical leave, and travel leaves.

The second major component, educational media services, includes expenditures for activities related to managing and directing educational media, school library services, and audiovisual services. The intent of this component is to capture costs associated with use and preparation of those devices, content materials, methods or experiences used for teaching and learning purposes. The emphasis here is not on training of instructional staff to use the library services or other audiovisual materials, per se, but rather on the general personnel and materials costs involved with preparing audiovisual and other media for use by staff and students. Textbooks are not intended to be charged to this component.

We recognize the fact that interpretations of traditional staff improvement spending (workshops, tuition, in-service training, etc.) are clouded when items like media services are included in a variable such as instructional staff support. However, the variable might also underestimate true staff improvement spending because it does not account for the time costs involved with participation in instructional staff support training. For example, if a teacher attends a day-long training seminar during regular school hours then the provision of a substitute teacher is an added cost on top of travel, registration and other material costs of that seminar. Normally the salaried teacher will also be paid for attending that seminar. A broader definition of professional development costs therefore would need to include these additional salary and benefit payouts to the teacher, among other less obvious costs. Emerging work from the Consortium for Policy Research and Education (CPRE) at the University of Wisconsin utilizes a broader definition of professional development costs like this and has found that the traditionally unobserved time costs greatly exceed what is typically listed as spending on professional development. This example highlights the difficulty in accounting for true investments in professional development and associated expenditures. However, by emphasizing cross-sectional comparisons and longitudinal analyses, we believe we can use the F-33 variable to provide useful insight into the general patterns of school district spending on instructional staff development expenditures.

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Merging the F-33 and CCD for Database Creation

We utilized the F-33 database cleaning protocols developed by O'Leary and Moskowitz (1995) in order to identify standard operating school districts from other administrative units surveyed in the F-33. In the protocols, the authors summarize the steps employed by three major school finance research groups to clean and maintain a consistent database for school finance research (see table 1). After close inspection, however, we found that only four of the seven recommendations by O'Leary and Moskowitz were useful and found the need to add two new steps to the process.

Although the recommendations of O'Leary and Moskowitz are very useful for winnowing out aberrant school districts, several steps proved questionable in our efforts. O'Leary and Moskowitz note enrollment discrepancies between counts in the F-33 and CCD. We found, as they did in 1995, that several cases with egregious enrollment discrepancies were due to miscoding of school districts with the same names in the same states. No treatment was suggested for this enrollment issue. However, when blending the two data sets O'Leary and Moskowitz recommend merely replacing a missing enrollment record with an available enrollment count from the other survey. Given that this would introduce an uncertain element of bias into the study, we skipped this step entirely. If enrollment counts were missing after regular winnowing by district types, then the entire record was also removed. All per-pupil statistics reported in this paper are based on the F-33 enrollment counts. Second, removal of records where Individualized Education Program (IEP) counts exceeded 50 percent of total enrollment had unintended consequences. Since no IEP counts were recorded for Kentucky in 1991–92 and again in 1994–95, as well as Ohio, Oklahoma, Pennsyl-

Table 1.—Steps taken to join Common Core of Data (CCD) and F-33 datafiles: Methods compared

Steps	O'Leary and Moskowitz (1995)	Killeen, Monk, and Plecki (1999)
1	Merge CCD and F-33 to replace missing enrollments.	Skipped
2	Purge out special or non-operating districts based on the F-33 district types.	Adopted
3	Purge out non-operating districts based on CCD district type codes.	Adopted
4	Purge out districts based on F-33 and CCD district level and grade-span codes.	Adopted
5	Purge districts with zero enrollments or zero revenues and expenditures.	Adopted
6	Purge districts with VOC, TECH, SPEC or AGRIC, in their names.	Skipped
7	Purge districts with greater than 50 percent of their enrollment classified as special education.	Skipped
8		Removed aberrant States from certain years, rather than impute for missing values.
9		Adjusted expenditures by Chambers (1998) Geographic Cost of Education Index

SOURCE: Adapted from O'Leary, Michael and Moskowitz, Jay. 1995. "Proposed 'Good Practices' for Creating Data bases from the F-33 and CCD for School Finance Analyses." In William J. Fowler, Jr. (Ed.), *Selected Papers in School Finance, 1995.* Available online at http://nces.ed.gov/pubs97/97536-5.html.

vania, and Virginia for 1991–92, removal of records based on the recommended criteria would remove the entire state from consideration.[4] Third, the text search for special school districts not immediately winnowed by the F-33 and CCD district types proved onerous and unproductive. In both the 1991–92 and 1994–95 data files, only a handful of records were found that met their criteria. This step was also abandoned. These steps, including removal of States with unreported data for instructional staff support (discussed below), reduced the original number of records in the F-33 by between 20–25 percent for both survey years.

Dealing with the F-33: Handling Missing Records for Instructional Staff Support

Even with the basic database development steps, our research still required handling of those records with missing data for instructional staff support. Unfortunately, the F-33 does not differentiate a missing value for that of a value equal to zero. No flags indicate whether a school district spends zero on teacher professional development or failed to report any spending for this item. During the F-33 universe years, approximately one-third of all states report some level of missing values for the instructional staff support. Our research identified those states high missing values relative to the total number of school districts in the modified data set. States with missing values above 15 percent were identified.

Imputation of those missing records is desirable but premature in our research. One main purpose of our work with the Center for the Study of Teaching and Policy is to understand the empirical and institutional foundation for expenditures on staff development activities. By estimating spending on instructional staff support, prior to a full understanding of what goes into this expenditure item, is hasty and unnecessary. The empirical research is generally sound and will greatly expand our understanding of the conditions under which school districts expend resources for staff development. However, without a rich contextual database for each school district, imputation for missing records through statistical inference would add little to our understanding. We feel as though

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[4] According to CCD file documentation from 1991–92, no IEP counts were reported for Guam, Kentucky, Ohio, Oklahoma, Pennsylvania, Puerto Rico, or Virginia. Louisiana counts included only students in self-contained classrooms. New Hampshire figures declined from the previous year because a reporting error was corrected. Sizable changes from 1990–91 are generally associated with an increase in the number of agencies for which IEP counts were reported (U.S. Department of Education 1998).

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we can generate a valid empirical understanding of the magnitude of instructional staff development spending in school districts as well as general trends, but know very little about the contextual circumstances that determine that spending. Removal of aberrant states was therefore more acceptable than imputation. As such, for our cross-sectional work based upon the 1994–95 data set, we removed California, Montana, Nebraska, Nevada, and North Dakota from the analyses.

The longitudinal analysis also revealed additional data problems. Several states, such as Tennessee and New Jersey, displayed implausible growth rates for per-pupil spending on instructional staff support. With these findings we re-examined our database methodology but found it to be sound on two levels. First, neither state experienced dramatic enrollment change over the study period. Holding expenditures for instructional staff support constant, enrollment growth would be expected to decrease per-pupil expenditures. The reverse is also true. But neither state exhibited such enrollment changes. Second, neither New Jersey nor Tennessee reported significant (greater than 15 percent) missing records for our target variable. In the course of our research, we found that school districts in 11 states reported incomplete data to the U.S. Bureau of the Census. The five states from 1994–95 are listed above. In 1991–92, those states were Alaska, Arizona, Massachusetts, Maine, New Jersey, and Tennessee. Although the U.S. Bureau of the Census imputed values for many of these districts,[5] we still found the growth statistics to be implausible and therefore excluded all 11 states from our longitudinal analyses.

Chambers' ... GCEI was used to adjust for regional differences in instructional staff development expenditures that stem from differences in the cost of key inputs into the educational process.

Geographic Cost Index[6]

Comparison of school districts across rural and urban continuums, as well as region, requires standardization of educational costs. For school districts these differences arise from several sources, including variation in the salaries that must be paid to hire and retain teachers, as well as variation in the extent and nature of the educational services being delivered. Controlling for costs also affords a proximate measure by which to adjust expenditures by geography (Chambers 1998, xi).

Chambers' 1998 release of the Geographic Cost of Education Index (GCEI) was used to adjust for regional differences in instructional staff development expenditures that stem from differences in the cost of key inputs into the educational process. Chambers used a hedonic wage model to predict cost differences for each U.S. school district. The GCEI relies on three main input categories: certified school personnel, noncertified school personnel, and nonpersonnel inputs like supplies, furnishings, utilities, and contract expenditures (Chambers 1998, 7). The GCEI is available for the years 1990–91 and 1993–94. These index years were used to adjust our databases for the years 1991–92 and 1994–95, respectively. The implication of this mismatch is truly unknown, though likely to be small for two reasons. Chambers' (1998) research indicates an extremely high correlation of GCEI indices over a period of 6 years, indicating that GCEI estimates for 1 year are a suitable estimate for another year. Second, local economies on the whole tend to shift in period fashion, rather than abruptly. Therefore, changes on a year-to-year basis will likely be small and of minimal impact on school input costs. These two points are assumptions and limitations with our database creation. As more specific cost of education indices becomes available, we will readjust our database. Chambers (1998) does note that the GCEI tends to minimize differences between school districts in terms of expenditures, which would mean measurement of expenditure inequality in our database will likely be smaller than in reality.

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[5] The U.S. Bureau of the Census indicated that individual records in these states were estimated one of two ways. If a minority of school districts in the state could be accurately estimated based off of share ratios from other districts in the state, those ratios were used to impute the missing records. Alternatively, some records in states were imputed using national share ratios, if that state was representative of the entire nation. Missing records were not imputed for some states, mainly the ones we identified earlier, because of uniqueness in their structure, i.e., extremely small, rural districts in Montana. Sharon Meade of the Governments Division, U.S. Bureau of the Census, described these database limitations to Kieran Killeen (7/99).

[6] This section borrows heavily from our working paper, recently submitted to the *Journal of Education Finance* (see Killeen, Monk, and Plecki 1999).

Choosing Reporting Statistics and Interpreting Results

Our initial research on professional development spending focused primarily on the differences in staff improvement expenditures across place and time. Comparison of resources by place requires standardization by population size. As per conventions in the school finance literature, our research reports on findings in per-pupil terms and in terms of the share of total general fund expenditures. We recognize that per-pupil expenditures do not intuitively capture an expenditure item that deals almost exclusively with expenditures for teacher development and improvement. A statistic that compares expenditures on staff development standardized by instructional staff size would be both interesting and useful. The Bureau of Labor Statistics reports private sector training expenditures in terms of expenditures per employee.

Several issues made it difficult to construct this statistic. It is neither clear in the F-33, nor in the general staff development literature, how staff development dollars are allocated across school district employees. Typically, it is assumed that the vast majority of dollars go towards the teaching staff. However, to what degree administrative aides, administrators, and other specialized school district personnel receive staff development dollars to improve instruction is unclear. In all likelihood, school district allotment formulas for staff improvement dollars may be more similar than different across the United States. Future research may advance our understanding of how personnel categories differentially absorb professional development resources. At this juncture, reporting staff improvement expenditures in per-pupil terms satisfies general weighting criteria, and allows for comparison of resources across space controlling for population size. We also chose to report expenditures as a share of total general expenditures.

On average, in 1994–95, U.S. school districts spent 2.76 percent of total expenditures on instructional staff support.

Findings

The methodology we employed to manipulate the F-33 data served as the base for two sets of analyses of spending on professional development. A brief summary of those findings is presented here.

On average, in 1994–95, U.S. school districts spent 2.76 percent of total expenditures on instructional staff support (see table 2). When reported in per-pupil terms, instructional staff support equates to about $200 per pupil. When summed by state to the national level, 3.32 percent of total expenditures are devoted to instructional staff support. This latter statistic is the weighted average. Table 2 reports both the weighted and simple averages.

We found a reasonable degree of consistency in spending on instructional staff support across all school districts in both per-pupil terms and as a share of total expenditures. We found that most U.S. school districts expend between 2 and 5 percent of their budget on this item. States with school districts exceeding this trend include Kentucky, South Carolina, Tennessee, Virginia, and Florida. School districts across Kentucky, for example, spend on average 8 percent of total expenditures on instructional staff support or more than $500 per pupil, the highest in the nation.

Our analyses also revealed moderate growth in the level of spending on professional development. We found that between 1992 and 1995, spending on instructional staff support grew by 25 percent in per-pupil terms. In terms of the share ratios, we found an 8 percent increase in the average budget share devoted to instructional staff support spending.

The most interesting caveat to our national analysis concerns differences in average spending levels by urbanicity. In preliminary work, we found that urban districts expend more on instructional staff support in per-pupil terms and in terms of total general expenditures. These findings held on a simple three-point urbanicity scale (urban, suburban, and rural). We advanced our analysis by examining expenditure patterns via a seven-point scale readily available in the Common Core of Data (Killeen, Monk, and Plecki 2000).

When districts are coded by urbanicity (see table 3), we found that population density relates to expenditures on instructional staff support; spending increases with density. Districts in large central cities spend 3.43 percent of their budgets on instructional staff support, whereas ru-

Table 2.—State spending on instructional staff support (1994–95): State-by-state comparisons[1]

			Instructional staff support expenditures as a percentage of general expenditures		Instructional staff support expenditures per pupil	
State[2]	Enrollment	Instructional staff support (ISS in 000's)	Weighted average[3]	Simple average[4]	Weighted average	Simple average
Nation[5]	**37,515,224**	**8,033,816**	**3.32**	**2.76**	**214**	**192**
Top five states ranked by enrollment						
Texas	3,670,007	752,175	3.49	2.57	205	184
New York	2,738,028	469,053	2.00	2.80	171	267
Florida	2,107,514	640,769	4.56	4.46	304	299
Illinois	1,897,161	313,845	2.76	2.07	165	126
Ohio	1,829,761	396,060	3.71	3.00	216	173
Top five states ranked by share of instructional staff support to total expenditures (simple average)						
Kentucky	639,992	311,882	8.14	8.10	487	504
South Carolina	638,548	179,659	4.99	5.20	281	306
Tennessee	870,594	196,846	4.54	4.73	226	237
Virginia	1,058,709	313,716	4.69	4.52	296	294
Florida	2,107,514	640,769	4.56	4.46	304	299

[1] The expenditure data were adjusted using Chambers' 1998 Geographic Cost Index.

[2] The following states were removed from the analysis due to a high proportion of missing values in 1994–95: California, Montana, Nebraska, Nevada, and North Dakota.

[3] The weighted average is calculated as the summation of expenditures per state divided by the total enrollment.

[4] The simple average is calculated as the average value per school district.

[5] The weighted average sums expenditures across the nation divided by the total enrollment.

SOURCE: U.S. Bureau of the Census. 1995. "Survey of Local Government Finances: School District Expenditures (F-33), 1994–95."

ral districts spend 2.46 percent. At $222 per pupil, districts in large central cities spend $40 more than rural districts. It is also interesting to note that as one travels from a center city core, through the suburbs, spending on instructional staff support falls. Spending then climbs in large towns, or places of greater population density.

We speculate that urban districts, over less urban districts, tend to spend more as a function of the higher demand for staff development programming. There are at least two reasons for this expectation. First, with high concentrations of young and inexperienced teachers, urban districts must spend more to train and retain their teaching force. Spending is greater because young teachers participate more frequently in training sessions and change jobs more often. The mobility issue, in particular, causes greater demand for new teacher training. Second, given that urban areas generally contain high poverty populations, federal dollars like Eisenhower Professional Development Program funds tend to flow disproportionately into urban areas.[7] For example, we found evidence that shows that urban school districts do in fact receive more Eisenhower funds, and argue that this could contribute to resources for higher spending.[8]

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[7] Federal program funds for professional development activities, especially Eisenhower funds, are also directed to institutions of higher education. Because colleges and universities also concentrate in urban areas, the availability for professional development training opportunities may be higher in urban areas than other places. Urban school districts, therefore, may spend more because more is available.

[8] Ibid.

Table 3.—Instructional staff support expenditures,[1] by school district urbanicity, 1994–95

	School district averages	
Urbanicity[2]	Instructional staff support expenditures as a percentage of general expenditures	Instructional staff support expenditures per pupil
Nationally[3]	**2.76**	**192**
Large central city	3.43	222
Mid-size central city	3.30	215
Urban fringe of large city	2.92	210
Urban fringe of mid-size city	3.03	192
Large town	3.42	208
Small town	3.04	195
Rural	2.46	182

[1] Fiscal data are adjusted using Chambers 1998 Geographic Cost Index.

[2] The urbanicity scale used here is a seven point National Center for Education Statistics (NCES) classification, where:

A. Large city: A central city of a Consolidate Metropolitan Statistical Area (CMSA) or MSA, with the city having a population greater than or equal to 250,000.

B. Mid-size city: A central city of a CMSA or MSA, with the city having a population less than 250,000.

C. Urban fringe of large city: Any incorporated place, Census designated place, or non-place territory within a CMSA or MSA of a large city and defined as urban by the U.S. Bureau of the Census.

D. Urban fringe of mid-size city: Any incorporated place, Census designated place, or non-place territory within a CMSA or MSA of a mid-size city and defined as urban by the U.S. Bureau of the Census.

E. Large town: An incorporated place or Census designated place with population greater than or equal to 25,000 and located outside a CMSA or MSA.

F. Small town: An incorporated place or Census designated place with population less than 25,000 and greater than or equal to 2,500 and located outside a CMSA or MSA.

G. Rural: Any incorporated place, Census designated place, or non-place territory designated as rural by the U.S. Bureau of the Census.

[3] This statistic represents a simple average of all school districts at the national level, then along the seven-point urbanicity scale.

SOURCE: U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33), 1991–92;" U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33), 1994–95;" and U.S. Department of Education, National Center for Education Statistics, Common Core of Data, 10-year longitudinal file.

Conclusion and Suggestions for NCES

In our two studies of professional development expenditures, the F-33 has proven to be a useful starting point for estimating local spending patterns within the national context. It is interesting to note that the magnitudes we find for the instructional staff support variable, as a proxy for total spending on professional development, are reasonably consistent with the array of findings from the case study research on this topic. In particular, the case study research on professional development spending, where individual budget records are analyzed on a case-by-case basis, researchers have found budget share ratios range between 1.8 to 3.0 percent (Little et al. 1987; Miller, Lord, and Dorney 1994; and Elmore 1997).

In this effort to analyze district level professional development spending patterns across the United States, the F-33 database has proven to be quite useful. Modifications to the database, including record cleaning techniques, are not difficult to administer. Researchers should continue to utilize the basic database cleaning techniques outlined by O'Leary and Moskowitz (1995) in order to standardize comparative studies based upon fiscal analyses of the F-33. We also feel researchers should continue to connect the F-33 with cost adjustment indexes such as those produced by Chambers (1998), as these indexes minimize the cost of education differences when comparing district fiscal patterns across the nation. In addition, the F-33 is easily linked with other NCES data sets through unique record identifiers. We found that these unique identifiers made district level fiscal records quite portable and easy to join with variables from the Common Core of Data. Our work with existing national data sets also highlight some inconsistencies in the conventions used to discuss total expenditures on teacher professional development.

As noted earlier, a number of cost accounting issues continue to cloud clear estimates of the total expenditures made on teacher professional development. For example, greater attention needs to be paid to the amount of time teachers and administrators are spending participating in training activities. Narrow descriptions of traditional professional development expenditures seem to avoid the importance of time costs, or those unaccounted salary and benefit costs of having teachers and staff participate in professional development training activities. Narrow descriptions also fail to include the importance of salary credits, the dollar amount that districts pay to staff over their careers for participating in training activities. There is no one right way to account for the total expenditures on teacher professional development, but clearly standards are needed. The NCES remains uniquely positioned to enhance existing and future databases to provide more consistent information about total spending on professional development.

...a number of cost accounting issues continue to cloud clear estimates of the total expenditures made on teacher professional development.

By providing new accounting standards for professional development, the NCES could foster greater consistency and agreement in the analysis of effective professional development training investments. There are essentially three areas where standards could substantively improve the quality of data and therefore enhance research opportunities. First, there is an absence of clear information on how professional development activities are funded. Specifically, greater information is needed on the share of federal, state and local fund sources, as well as the programmatic basis for the fund sources. Great emphasis, for example, is placed on federal Eisenhower Professional Development funds for improving the quality of teachers, but little is known about the collective effect of all federal program dollars for this purpose. Second, new standards could help focus attention on what is actually purchased with professional development resources. Limitations with existing national databases do not allow us to separate out professional development expenses by personnel status (teachers, administrators, or staff), or by type of expense (salary credit, travel, tuition reimbursement, registration, etc.). This limitation hinders the opportunity to focus attention on training teachers, as well as the opportunity to understand what are the major and significant costs of that training. The third benefit of new standards speaks to the need to tie investments in teacher training to traditional measures of equity as well as outcomes. Very little is known about how professional development dollars are distributed, whether they are spread evenly across and within districts, or tend to concentrate in particular areas, such as places of high poverty and teacher shortages. New standards could also foster the opportunity to connect the investments in teacher training with student outcomes. These three elements represent target areas by which to measure the effectiveness of new accounting standards for professional development programming.

Translating these standards into new data collection efforts would provide a substantial contribution to empirical research on teaching and learning. For example, with enhanced data on what is actually purchased with professional development resources, researchers could begin to explore what specific investments contribute to gains in overall student performance, the performance gains of low-income students, or even the types of investments that move poorly performing students to greater achievement. A national sample of school district finances, via an instrument that uses the new standards, could provide this data. Perhaps the closest opportunity to build a new data set exists in refinements to existing national surveys, such as the Schools and Staffing Survey (SASS), the National Educational Longitudinal Study (NELS), the Early Childhood Longitudinal Study (ECLS), or other such surveys conducted by the National Center for Education Statistics. At a minimum, the sample frames for these national surveys could be adopted and a fiscal survey could be conducted. Approached in this fashion, the blending of new standards for data collection on teacher professional development and linking to existing national databases would significantly improve research on effective teaching and learning.

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Making Money Matter: Financing America's Schools

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Executive Summary

A national desire to ensure that all children learn and achieve to high standards now poses fundamental challenges to almost every facet of business as usual in American education. Policymakers and educators are searching for better ways to provide today's schoolchildren with the knowledge and skills they will need to function effectively as citizens and workers in a future society that promises to be increasingly complex and globally interconnected. A key component of this quest involves school finance and decisions about how the $300 billion the United States spends annually on public elementary and secondary education can most effectively be raised and used.

A new emphasis on raising achievement for all students poses an important but daunting challenge for Policymakers: how to harness the education finance system to this objective. This challenge is important because it aims to link finance directly to the purposes of education. It is daunting because making money matter in this way means that school finance decisions must become intertwined with an unprecedented ambition for the nation's schools: never before has the nation set for itself the goal of educating all children to high standards.

This report argues that money can and must be made to matter more than in the past if the nation is to reach its ambitious goal of improving achievement for all students. There are, however, no easy solutions to this challenge, because values are in conflict, conditions vary widely from place to place, and knowledge about the link between resources and learning is incomplete. Moreover, without societal attention to wider inequalities in social and economic opportunities, it is unrealistic to expect that schools alone, no matter how much money they receive or how well they use it, will be able to overcome serious disadvantages that affect the capacity of many children to gain full benefit from what education has to offer.

Taking full account of conflicting values, wide variation in educational contexts, and strengths and limitations of existing knowledge, the Committee on Education Finance concludes that money can and should be used more effectively than it traditionally has been to make a difference in U.S. schools. To promote the achievement of a fair and productive educational system, finance decisions should be explicitly aligned with broad educational goals. In the past, finance policy focused primarily on availability of revenues or disparities in spending, and decisions were made independently of efforts to improve the educational system's performance. Although school finance policy must not ignore the continuing facts of revenue needs and spending disparities, it also should be a key component of education strategies designed to foster higher levels of learning for all students and to reduce the nexus between student achievement and family background.

To this end, the emerging concept of funding adequacy, which moves beyond the more traditional concepts of finance equity to focus attention on the sufficiency of funding for desired educational outcomes, is an important step. The concept of adequacy is useful because it shifts the focus of finance policy from revenue inputs to spending and educational outcomes and forces discussion of how much money is needed to achieve what ends. It also could drive the education system to become more productive by focusing attention on the relationship between resources and outcomes.

Making money matter more requires more than adequate funding.

Applying an adequacy standard to school finance is at present an art, not a science. Misuse of the concept can be minimized if adequacy-based policies are implemented with appropriate recognition of the need for policy judgments and of the incomplete knowledge about the costs of an adequate education. Efforts to define and measure adequate funding are in their infancy. A number of technical challenges remain, including the determination of how much more it costs to educate children from disadvantaged backgrounds than those from more privileged circumstances. Beyond these, some fundamental questions about educational adequacy (such as how broad and how high the standards should be) are ultimately value judgments and are not strictly technical or mechanical issues. A key danger is that political pressures may result in specifying adequacy at so low a level as to trivialize the concept as a meaningful criterion in setting finance policy, or at so high a level that it encourages unnecessary spending. Another is that Policymakers will fail to account for the higher costs of educating disadvantaged students.

Making money matter more requires more than adequate funding. It also requires additional finance strategies, such as investing in the capacity of the education system, altering incentives to ensure that performance counts, and empowering schools or parents or both to make decisions about the uses of public funds. For money to matter more, it must be used in ways that ensure that schools will have the capacity to teach all students to higher standards as well as the incentive to do so. Policy options involve choices among individual finance strategies and combinations of strategies; policy decisions will depend partially on philosophical outlook but can also be informed by careful attention to evidence from research and practice. Attention to context is important as well, as educational and political conditions diverge widely from place to place and individual policy options will often vary in effectiveness depending on local circumstances.

Educational challenges facing districts and schools serving concentrations of disadvantaged students are particularly intense, and social science research provides few definitive answers about how to improve educational outcomes for these youngsters. While pockets of poverty and disadvantage can be found in all types of communities, the perceived crisis in urban education is especially worrisome. Ongoing reform efforts should be encouraged and evaluated for effectiveness. At the same time, systematic inquiry is needed into a range of more comprehensive and aggressive reforms in urban schools. Piecemeal reform efforts in the past have not generated clear gains in achievement, and generations of at-risk schoolchildren have remained poorly served by public education. Because the benefits of systematic inquiry will extend beyond any one district or state, the federal government should bear primary responsibility for initiating and evaluating bold strategies for improving education for at-risk students.

Improving the American system of education finance is complicated by deeply rooted differences in values about education, the role of parents in guiding the development of their children, and the role of individuals and governments in a democratic society. In addition, there are serious shortcomings in knowledge about exactly how to improve learning for all students. Education policy cannot ignore these facts. Instead, the challenges are to balance differing values in a thoughtful and informed manner and continuously to pursue bold, systematic, and rigorous inquiry to improve understanding about how to make money matter more in achieving educational goals. The committee is convinced that these challenges can be met and that the nation can improve the way it raises and spends money so that finance decisions contribute more directly to making American education fair and effective.

Finance policy and practice, especially now that they are being linked to the nation's highest ambitions for schools, touch on virtually all facets of education.

The Committee's Charge and Approach

The Committee on Education Finance was established under a congressional mandate to the U.S. Department of Education to contract with the National Academy of Sciences for a study of school finance. In fleshing out the brief mandate assigned from Congress, the department charged the committee to evaluate the theory and practice of financing elementary and secondary education by federal, state, and local governments in the United States. The key question posed to the committee was: ***How can education finance systems be designed to ensure that all students achieve high levels of learning and that education funds are raised and used in the most efficient and effective manner possible?*** In carrying out its study, the committee was further charged to give particular attention to issues of educational equity, adequacy, and productivity.

The committee translated these key questions into three goals for education finance systems. This translation provided objectives against which to evaluate the performance of existing arrangements and the likely effects of proposed changes:

Goal 1: Education finance systems should facilitate a substantially higher level of achievement for all students, while using resources in a cost-efficient manner.

Goal 2: Education finance systems should facilitate efforts to break the nexus between student background characteristics and student achievement.

Goal 3: Education finance systems should generate revenue in a fair and efficient manner.

Finance policy and practice, especially now that they are being linked to the nation's highest ambitions for schools, touch on virtually all facets of education. Inevitably, therefore, finance is controversial; education policy is one of the most contentious items on the public policy agenda because it is deeply enmeshed in competing public values. Widespread support for equality of educational opportunity masks disagreement over the extent to which high levels of fiscal equality among students or between school districts is required and over the extent to which it is appropriate for parents to spend some of their resources to benefit their own children in preference to others. The division of powers in U.S. government and a traditional emphasis on local control make changes in the dispersion of responsibilities for raising and spending education dollars difficult and slow. Americans' deep belief in the value of efficiency becomes complicated to act on when it encounters limited knowledge about what efficient solutions are in education, disagreements about what the ends of education should be, and belief that the educational system should be democratically governed and responsive to a variety of local, state, and national needs and views. It is thus hard for schools to be both democratic institutions and to have the focused and durable goals that are viewed by some as necessary for an efficient system.

Education policy in general and finance policy more specifically raise difficult questions that require both moral wisdom and empirical research. Experts, such as the members of the Committee on Education Finance, can contribute to policy making by examining evidence and by rationally and objectively clarifying the values and objectives at stake. They cannot resolve all disagreements, but they can render some views more reasonable and others less so.

The committee's inquiry into education finance takes place against the backdrop of a highly decentralized and diverse system of U.S. education that makes description and generalization difficult. The existing finance system is broadly characterized by delegation of significant responsibility for education to the local level, by an average division of funding responsibilities roughly even between state and local governments (with the federal government providing only about 7 percent of education revenues available to schools), and by great variation from place to place in the funds available for education and the level of government that provides them. Education is not mentioned in the federal Constitution and therefore has been viewed as a power reserved to the states, most of whose constitutions specify the provision of education as a key state obligation.

Another backdrop for the committee's deliberations is its assessment of the current condition of education as it relates to the three goals. Regarding goal 1—promoting higher achievement for all students—and goal 2—reducing the nexus between student achievement and family background—the committee concluded that although schools are not failing as badly as some people charge, they are not sufficiently challenging all students to achieve high levels of learning and are poorly serving many of the nation's most disadvantaged children. The continuing correlation between measures of student achievement and student background characteristics, such as ethnic status and household income, looms ever more serious as global economic changes have increasingly tied the economic well-being of individuals to their educational attainment and achievement. Particularly troublesome is the perceived crisis in education in many big-city school systems, a condition that has concerned Policymakers since the 1960s but has been too often stubbornly resistant to improvement.

Regarding goal 3—raising revenue fairly and efficiently—the United States is unique in its heavy reliance on revenue raising by local school districts, the extensive use of the local property tax, and the small federal role. Despite significant amounts of state financial assistance to local school districts, spending levels vary greatly among districts within states and also across states, a situation that many people believe is unfair. Moreover, the local property tax is not always administered equitably and may generate a greater burden on taxpayers with low income than on those with high income. Efforts to increase fairness, however, must be balanced by sensitivity to possible effects on the efficiency with which funds are raised.

Fairness and Productivity in School Finance

Fairness in the distribution of education dollars has long been an objective of school finance reformers, but one that has frequently been thwarted by the political realities of an education system that allocates much of the responsibility for funding and operating schools to local governments. Concern about how funding policies and practices affect the performance of schools is a more recent development, but one that is becoming ever more central to school finance decision making.

In the aftermath of Brown v. Board of Education…the United States awoke from its historical indifference to the problem of unequal educational opportunities and began to address them.

In the aftermath of *Brown v. Board of Education*, 347 U.S. 483 (1954), the United States awoke from its historical indifference to the problem of unequal educational opportunities and began to address them. Beginning about 1970, the nation entered a notably vigorous period of school finance reform aimed at making the distribution of education dollars more fair. Litigants in a number of states succeeded in having state finance systems overturned in court on the grounds that they violated state constitutional equal protection provisions or education clauses. In the wake of these court decisions, virtually all states, whether under court order or not, substantially changed their finance systems. State and federal governments also created a number of categorical programs directing resources to students with special education needs and to some extent compensating for funding inequities at the local level.

Despite these changes, U.S. education continues to be characterized by large disparities in educational spending. While within-state funding disparities decreased in

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some states, especially those subject to court-mandated reform, large disparities persist. Moreover, disparities continue to mirror the economic circumstances of district residents; districts with lower-income residents spend less than districts whose residents have higher incomes. In some districts, this pattern is repeated in school-to-school spending differences. Nationwide, over half of the disparity in district per-pupil spending is the result of differences in spending between states rather than within states.

Particularly in the last decade, the concept of fairness as it applies to school finance has taken on a new emphasis, spawning another round of litigation and reform. The pursuit of fairness has moved beyond a focus on the relative distribution of educational inputs to embrace the idea of educational adequacy as the standard to which school finance systems should be held.

Despite the success of adequacy arguments in several prominent school finance court decisions, there is as yet no consensus on its meaning and only limited understanding about what would be required to achieve it.

Despite the success of adequacy arguments in several prominent school finance court decisions, there is as yet no consensus on its meaning and only limited understanding about what would be required to achieve it. Adequacy is an evolving concept, and major conceptual and technical challenges remain to be overcome if school finance is to be held to an adequacy standard. Earlier concepts of equity posed similar challenges in their infancy, although over time much progress was made in defining and measuring them. Similar progress may be expected here. In the meantime, awareness of the shortcomings in current understanding of adequacy is important for all who would use the concept in either policy making or in research.

In part, efforts to use finance policies to achieve educational adequacy depend centrally on understanding how to translate dollars into student achievement. In fact, however, knowledge about improving productivity in education is weak and contested. The concept itself is elusive and difficult to measure. There is as yet no generally accepted theory to guide finance reforms. Instead multiple theories, each of which is incomplete, compete for attention. Empirical studies seeking to determine the best ways to direct resources to improve school performance have produced inconsistent findings. *Equality of Educational Opportunity*, the famous study of the mid-1960s known as the Coleman Report, found that, after family background factors were statistically controlled, school resource variation did not explain differences in student achievement. The Coleman report ushered in decades of productivity research attempting to understand (and perhaps discredit) that counterintuitive result. For many years, the inability of researchers to speak consistently on how to improve schools has frustrated scientists and Policymakers alike. While there is still a great deal of uncertainty about how to make schools better or how to deploy resources effectively, the committee's review of the last several decades of research and policy development on educational productivity makes us more optimistic than our predecessors regarding the prospects for making informed school finance choices. Thirty years' worth of insights have generated a host of ideas about how to use school finance to improve school performance, and researchers have learned to ask better questions and to use improved research designs that yield more trustworthy findings. Knowledge is growing and will continue to grow. One major implication of this fact for school finance is that good policy will reflect both the best knowledge available to date *and* the need to continue experimenting and evolving as new knowledge emerges.

Even while understanding is becoming more sophisticated, knowledge about how to improve educational productivity will always be contingent and tentative, in part because the characteristics and needs of key actors—the students—differ greatly from place to place. Therefore, solutions to the challenge of improving school performance are unlikely ever to apply to all schools and students in all times and places. Policymakers and the public will have to consider evidence and analysis about the strengths and weaknesses of strategies for change as they also weigh differing values about what Americans want their schools to be and to do.

Strategies for Meeting the Goals

Four generic strategies can be used to make money matter more for U.S. schools and to propel the education system in desirable directions:

- Reduce funding inequities and inadequacies;
- Invest more resources (either new or reallocated from other uses) in developing capacity;
- Alter incentives to make performance count (within the existing governance structure); and
- Empower schools and parents to make decisions about the use of public funds (thereby altering governance and management relationships).

Reducing funding inequities and inadequacies includes options such as reducing disparities in funding across schools, districts, or states; ensuring that all schools or districts have funding sufficient to provide an adequate level of education to the students they serve; and raising revenue more fairly without neglecting efficiency. Investing more resources in developing capacity refers not only to the capacity of the formal education system to provide services but also to the capacity of students to learn. Hence, it includes investments in inputs, such as teacher quality and technology, and in programs, such as preschool for disadvantaged students. Altering incentives embraces changes in incentives designed to operate primarily within the existing system of school governance and includes policies such as restructuring teacher salaries, use of school-based incentive programs, and changes to the incentives built into financing formulas for students with special needs. Empowering schools and parents refers to policies that would decentralize significant authority over the use of public funds, to schools in the form of site-based management or charter schools, and to parents in the form of significant additional parental choice over which schools (public and perhaps private as well) their children will attend.

Finance policies ought to reflect the interrelatedness of the various facets of the finance system and the possibility that complementary changes may be required for reform to be successful.

In reality, policymakers do not and should not consider strategies in isolation. Finance policies ought to reflect the interrelatedness of the various facets of the finance system and the possibility that complementary changes may be required for reform to be successful. Indeed, some visions of overall education reform explicitly call for a set of intertwined finance strategies.

Our decision to examine the strategies separately is useful for analytical purposes, but it also reflects the important fact that strategies can be combined in different ways. It is important to emphasize, however, that not all strategies are compatible. For example, a centrally (i.e., state or school district) managed program of investment in capacity would not fit naturally with a program that empowers parents and schools to make decisions about the kind of capacity in which they wish to invest.

For each of the three goals for an education finance system, we evaluate a variety of policy options employing these strategies and weigh the evidence on how effective they are likely to be in helping meet the objectives.

Achieving Goal 1: Promoting Higher Achievement for All Students in a Cost-Efficient Way

- Adequate funding (sufficient funding for efficiently operating schools to generate higher achievement levels) is clearly essential for meeting goal 1. Although we do not know how to identify this level with precision, it is important to try. But providing adequate funding by itself may do little to foster significant improvements in overall student achievement. Thus, while funding adequacy may be a necessary part of any education reform effort—and is likely to be especially crucial for districts or schools serving disproportionate numbers of disadvantaged students—it is at most part of an overall program for increasing student achievement in a cost-efficient way.
- Teaching all students to higher standards makes unprecedented demands on teachers and requires changes in traditional approaches to teacher training and retraining. In addition to nonfinance policies for investing in the capacity of teachers (e.g., reforming teacher preparation and licensing), finance options might include raising teacher salaries and investing in the professional development of teachers once they are on the job. Given schools' need to hire 2 million new teachers over the coming decade, raising salaries—especially for new hires—may be needed to ensure sufficient numbers of qualified people in classrooms. Professional development that is aligned with curriculum re-

form and teaching objectives offers the promise of changing teaching practice in ways likely to improve student performance. But neither approach is likely to be effective in achieving goal 1 unless it is aligned with appropriate incentives throughout the education system to make performance count.

- Altering incentives responds to the fact that the school finance system historically has operated almost in isolation from educational performance, in that educational goals and desired outcomes have seldom been reflected in pay for teachers and budgets for schools. Traditional teacher salary schedules provide higher pay for experience and postgraduate degrees, neither of which appears to be systematically linked with student achievement. Skill and knowledge-based pay shows greater promise for making teachers more effective in the classroom but remains to be tested. School-based accountability and incentive systems are increasingly popular and seem to contribute to desired student outcomes. To be fully effective, however, they require adequate funding for schools and attention to capacity building.
- Empowering schools or parents to make decisions about public funds (via enhanced site-based management, charter schools or contract schools, or vouchers, for example) has been justified as a strategy for improving student achievement in a cost-efficient way based on a variety of different arguments: some contend that local control will enhance innovation at the school level; some believe that schools with a strong sense of community perform better; and some believe that the introduction of competition and the possibility of losing students (and their associated funding) will encourage schools to be more productive than under the current monopoly situation. Although positive effects for children using vouchers have been reported from several sites where vouchers have been tried, the small scale of current programs leaves many important questions unanswered.

Although positive effects for children using vouchers have been reported from several sites where vouchers have been tried, the small scale of current programs leaves many important questions unanswered.

Achieving Goal 2: Reducing the Nexus Between Student Achievement and Family Background Characteristics

- As money is made to matter more in education, funding disparities will become increasingly worrisome, because their effects on achievement will be magnified to the detriment of children in underfunded schools, many of whom are likely to be from disadvantaged backgrounds. The new focus on funding adequacy has the potential to help disadvantaged students, but it will do so only to the extent that school funding formulas are appropriately adjusted for the additional costs of educating youngsters from disadvantaged backgrounds.
- Achieving goal 2 will also require attention to increasing both the capacity of children to learn and of schools to teach. Children raised in economically and socially impoverished environments or suffering from physical disabilities often come to school less ready to learn than their more advantaged counterparts. Schools must deal with these problems, even though they alone will not be able to solve them. A strong consensus has emerged among policymakers, practitioners, and researchers about the importance of increasing investments in the capacity of at-risk children to learn, by focusing on the school-readiness of very young children and by linking education to other social services, so that the broad range of educational, social, and physical needs that affect learning are addressed. Programs providing early childhood interventions and school-community linkages give evidence of both promise and problems, suggesting that there is still much to learn about making these investments effectively.
- That more investment is needed in the capacity of schools to educate concentrations of disadvantaged students would seem to be obvious given the dismal academic performance of many of these students, but as yet we have only incomplete answers to the question of which types of investments are likely to be the most productive and how to structure them to make them effective. The quality of teachers is likely to be a key compo-

nent; reducing class size might help under certain conditions; whole-school restructuring may have significant potential; and the dilapidated state of school buildings in many older urban areas suggests that reform of facilities financing must also be attended to. Again, the effectiveness of any individual policy change may depend on how it is linked to an interconnected set of strategies for improving school performance, and some critics question whether these most troubled of U.S. schools can be reformed through strategic investments and related strategies, or whether they require much more fundamental structural change, such as might be brought about by a voucher program.

- Most federal and some state aid flows to schools via categorical programs tied to the special needs of certain groups of disadvantaged students. Title I compensatory education grants and special education funding are the chief examples. Questions have been raised about the extent to which the incentives deliberately or inadvertently created by categorical programs serve educationally desirable purposes and whether and to what extent it continues to be appropriate to treat children with special needs separately in an educational system increasingly oriented toward fostering higher levels of learning for all students. Our findings suggest that previously defined sharp distinctions between students with special educational needs and other students have compromised educational effectiveness and that current efforts to move toward more integrated school programs should be facilitated by the finance system.

Most federal and some state aid flows to schools via categorical programs tied to the special needs of certain groups of disadvantaged students.

- Arguments for dramatic changes in school governance (by empowering schools or parents to make decisions about public funds) may be more compelling in urban areas with large numbers of disadvantaged students than in the educational system in general for a number of reasons. The size of many urban districts and the continuing fact of racial and economic segregation offer many urban residents much less choice over where and how to educate their children than suburban residents have. Moreover, urban residents have arguably benefited least from prior school reforms. Some economic models suggest that, among choice options, charter schools and vouchers, rather than interdistrict and intradistrict choice programs, are the approaches most worthy of further exploration as vehicles for improving poor-performing schools. At present, however, little is known about the effects of either. Extensive evaluation is needed of the many charter efforts currently under way. Vouchers, both publicly and privately funded, are being tried in a number of cities, but the existing small-scale efforts are unlikely to provide adequate information to assuage the concerns of those who question the need for so dramatic a break with traditional school finance policies.

Achieving Goal 3: Raising Revenue Fairly and Efficiently

- Shifting away from local revenue raising to greater reliance on state revenues and/or increasing significantly the federal role in revenue provision for elementary and secondary education would foster the goal of raising revenues fairly. Both, however, have to be considered in light of trade-offs and complementarities with the other two goals of a good financing system and with attention to maintaining some local control over managerial decisions.

- A larger federal role in providing education revenues could be justified either on the grounds that is fair and appropriate for the federal government to take responsibility for disproportionate needs of students who are poor, who have disabilities, or are otherwise educationally disadvantaged, or on the grounds of ensuring that all states can provide adequate education funding. Fully funding federal compensatory education programs would be consistent with past federal policy and is likely to be the more politically viable of the two approaches. The alternative of a new federal foundation aid program based on an adequacy justification would entail a significant change in federal policy and would raise many of the same analytical, conceptual, and political issues that arise in the formulation of adequacy programs at the state level.

Finally, the report draws attention to the nation's need for better and more focused education research to help strengthen schools and bring about substantial improvements in student learning. Acknowledging the especially challenging conditions facing many big-city educators, the committee proposes three new substantial research initiatives in urban areas (without specifying the priority among them): (1) an experiment on capacity-building that would tackle the challenges of developing and retaining well-prepared teachers; (2) systematic experimentation with incentives designed to motivate higher performance by teachers and schools; and (3) a large and ambitious school voucher experiment, including the participation of private schools. Meeting the nation's education goals will depend in part on continuously and systematically seeking better knowledge about how to improve educational outcomes, through new research initiatives such as these along with more extensive evaluation of the many reform efforts already under way.

Reform and Resource Allocation: National Trends and State Policies

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Introduction

The last decade has been a time of dramatic policy shifts in education in the United States. Two closely related movements have been at work. The first is standards-based reform in which curriculum, teacher professional development, and assessments are all tied to standards set by a public authority, typically a state. (See Fuhrman 2001 for analysis of standards movement.) The second is the accountability movement, which places heavy emphasis on schooling outcomes by regularly measuring student performance and rewarding or punishing schools depending on how much students achieve. Both of these movements represent a striking change in how education in the United States has traditionally operated. Not many years ago education was viewed as operating in only a very loosely coupled manner—from the state to the district to the school to the classroom—with considerable discretion at every point in the system about what was taught and how it was taught. In addition, apart from occasional small scale experiments and short-term initiatives, schools and teachers operated fairly free of accountability for student outcomes and the system did little systematically to collect, and much less to analyze, outcome information. To the extent that there was accountability, it took the form of accounting for various education inputs, such as teachers, types of students, and dollars—not outcomes.

Evidence on the effect of these policy changes in the education system on student learning is beginning to emerge (e.g., Grissmer and Flanagan 1998), but it will take some years to assess the full effects. The changes are still being put into place and the policies themselves are being modified and refined. It is not too early, however, to examine how school districts are adapting to reform pressures. In the analysis here we focus on a narrow, but critical, summary measure of district response—resource allocation patterns in districts and how they have changed over time. In short, we ask how, and to what extent, have school districts strategically repositioned their resources in response to the reform demands of the last decade?

We use the school district level information from the *Annual Survey of Local Government Finances* (F-33) and the Common Core of Data (CCD) and examine both national trends in resource allocation patterns and whether districts in "high reform" states allocate resources in ways that differ from districts in other states.

Theory and General Analytic Approach

The research presented here presumes that organizations "learn" and adapt in response to the demands placed on them by their external environment. Modern organization theory sees organizations as systems of coordinated and controlled activities that are structured not only by technical production requirements but also by exchanges with an external environment which provides technical resources and confers institutional legitimization (e.g., Scott 1992, Pfeffer and Salancik 1978, Meyer and Scott 1983). As the environmental demands change, so does the organization. Research on educational organizations during the late 1970s and up until relatively recently has focused almost exclusively on institutional aspects of organization-environment relations (e.g., Zucker 1988; Meyer et al. 1988). These demands have little to do with the technical aspects of the organization and more to do with how the organization presents and links itself with the external environment, especially resource providers. During the 1990s, however, it is the technical demands on schools, specifically calls for higher student performance, that have pressured school districts. With a shift in technical demands, theory would predict a shift in the structure and allocation of the organization's resources.

Our research is designed to test the general proposition that a shift in technical demands on schools in the 1990s has resulted in a shift in resource allocation patterns. It also examines how responses may have been shaped by the strength of the external demands as well as by the context conditions of schools and school districts. We look for general national trends as well as more marked shifts in districts under particularly high performance pressure. While we expect schooling organizations to respond to external demands, the changes that take place may not necessarily lead to better outcomes for schools. March and colleagues (March and Simon 1958; Cyert and March 1963; March 1981; 1988) have challenged simplifying assumptions of rational behavior on the part of organizations and identified the variety of organizational mechanisms that may lead "learning" to be maladaptive in terms of performance outcomes. Therefore, in this research, while we describe the ways in which school districts and schools have responded to changes in their environments, we do not presume that the changes are necessarily changes that contribute to greater productivity. This is a task for later research.

Examining resource allocation longitudinally appears to be particularly useful.

Resource Allocation in Education

Numerous studies over the last three decades have focused on educational resources, but their concern has almost exclusively been on equity issues, usually the effect of court decisions on how money is raised and distributed across districts in a state. Studies of how resources are actually used within school districts and especially within schools are more recent and far more limited. Studies linking resources to reform efforts are rare.

Analyses of how the education dollar is spent are important. With the exception of the last few years, education spending in much of the last two decades has been relatively flat (Odden and Busch 1998) and recent economic conditions suggest that significant increases in the near future may well not continue. At the same time, demands for higher standards of student achievement have increased dramatically and show no sign of abetting. How districts are responding to these demands, given their budget constraints, is unclear. To what extent, and in what ways, are districts systematically repositioning their resources to shape an infrastructure with greater capacity?

Examining resource allocation longitudinally appears to be particularly useful. The Sixteenth Annual Yearbook of the American Education Finance Association (1996)—*Where Does the Money Go? Resource Allocation in Elementary and Secondary Schools*—edited by Picus and Wattenbarger is one of the first comprehensive treatments of resource allocation within schools and school districts. One central and often-cited finding reported in this volume is that approximately 60 percent of educational spending is for instruction. Because this finding is fairly consistent across a number of independent studies, some have interpreted it as an "iron law of education resource allocation." The studies showing this result, however, are cross-sectional, mainly based on data from the late 1980s and the very early 1990s. The only longitudinal analysis presented in the volume[1] is by Hanushek (1996) who reports results from a number of studies with colleagues (Hanushek and Rivkin 1994; Hanushek, Rivkin, and Jamison 1992) showing that real spending in education has shown considerable growth over the last three decades, but that a significant fraction of this growth has been in noninstructional areas. In short, when analyzed cross sectionally, differences in resource allocation patterns are small. But when analyzed longitudinally, large differences can be seen. A recent analyses of California data (Hannaway and Chun 1999) shows, for example, that between 1988 and 1997 school districts reduced spending at the central office level rather markedly and increased spending at the school level, suggesting that strategic shifts in resources in the last decade may be significant.

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[1] While some longitudinal analyses of schooling resources exist, the focus has been on only very general expenditure categories (Lankford and Wyckoff 1995; Rothstein and Miles 1995).

Recent research on resource allocation also suggests that studies with greater detailed information on expenditures show differences across school districts with different characteristics. Firestone, Goertz, and Natriello (1997) examined how districts in New Jersey with different wealth and client characteristics spent their resources following the legislative settlement of New Jersey's school finance suit. Their analyses showed that, among other things, "special needs" districts, typically districts with high poverty levels, spent more on student health and student social services and that wealthier districts spent more on the core education program. Findings by Hannaway and Chun (1999) corroborate the findings showing similar results with California data. Such findings not only suggest systematic differences in resource allocation, but also suggest that the nonacademic needs of large numbers of students from poverty backgrounds may tilt resource allocations in ways that put districts with high poverty levels at a disadvantage in terms of district investments in teaching and learning.

> *The F-33 data pose two challenges.... some years all districts were included, but in other years, some states only used a sample of districts.... [missing data] creates problems when trying to report trends....*

Below we first describe the data we used and then present the results of our analysis. We analyze the data in two ways. First, we present data over time to show general national trends in allocation patterns. What are the areas where support is increasing and where is it decreasing? We present the national picture since, while there are significant differences among states in the strength and strategies of reform, the movement in the United States is a national one with many sources of pressure for districts to change including the media, general public opinion, and the federal government. Second, we investigate whether districts in states with reform policies that exert particularly high levels of performance pressure allocate resources differently from districts facing more diffuse reform pressure.

Data

We use two sources of data for this study. The expenditure data are from the *Annual Survey of Local Government Finances, School Systems,* also known as the F-33. The survey collects school district data on both revenues by source and expenditures by function and subfunction.[2] Because the survey underwent major revisions in 1992 resulting in consistency problems with earlier years, we use fiscal year 1992 (1991–92) as the first year of expenditure data for this study and the final year as fiscal year 1997 (1996–97), the last year of data available at the time of analysis. Thus, 6 years of expenditure data are analyzed here. We used the National Center for Education Statistics' (NCES) Common Core of Data (CCD) for measures of poverty,[3] number of individual education plan (IEP) students, region, and urbanicity.

The F-33 data pose two challenges. First, for some years all districts were included, but in other years, some states only used a sample of districts.[4] These samples were usually random, but for California in FY94, only a nonrandom subset of districts, the largest 258 of its over 1,000 districts, were included. The second challenge is missing data which creates problems when trying to report trends because large numbers of districts can be lost in the analysis.

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[2] These data are collected by the Governments Division of the Bureau of the Census. It is publicly available at the following Web Site—http://www.census.gov/govs/www/school.html. The data are also included in the Common Core of Data (CCD).

[3] For these years, the CCD reports poverty levels based on the 1990 Census.

[4] In FY93, the following states had samples of districts taken: Arkansas, Colorado, Georgia, Kentucky, Mississippi, New Jersey, New Mexico, Oklahoma, and South Dakota. Districts in the same states, with the exception of Georgia and Mississippi, were sampled again in FY94.

We resolved both the sampling and missing data issues through imputation. We employed three basic rules. First, we dropped districts if the enrollment variable (V33) was equal to zero or missing for three or more consecutive years. This resulted in a loss of 793 cases, many of which are probably districts that merged or otherwise went out of existence. For the remaining districts, we imputed values for variables with missing data by calculating the rate of change in the value of the variable from the value prior to the data gap and the value after the data gap, then apportioning the difference proportionately across the missing years. So if there were a 2-year gap, we would assign half the difference to the first year and half to the second year. For data missing at the beginning or end of a series, we simply extrapolated.

We confined our analyses to regular districts with enrollments greater than or equal to 200 students and that had existed for the duration of the analysis (1992–97). The number of districts included in the analyses was 11,622. Table 1 shows the characteristics of the population of districts studied.

The National Picture

This section describes the general patterns in resource levels and resource use from 1992 to 1997 for districts nationally. Figure 1 shows a steady increase in total current expenditures, corrected for 1996–97 dollars. Districts in the United States have steadily increased spending each year since 1991–92, resulting in an increase of about 7 percent, on average, in real terms by 1997.

Figure 2 shows where these additional dollars went. We look specifically at the proportionate increase in instruction, pupil support services, instructional support services, district administration, and school administration relative to the overall proportionate increase in current expenditure. We focus on these expenditure categories since they represent the major functional areas of education-related work.[5] If the preferences and demands on school districts represent the historical pattern during the period studied, we would expect all categories of expenditure to increase by 7 percent, the overall increase. As can be seen, proportionately more was spent on instruction, instructional support services, and school administration, but not by much.[6] It was somewhat surprising that investment in instruction, especially instructional support services, was not heavier given the technical demands of reform. Increases in expenditures on pupil personnel services, an area of expenditure directly related to special education, showed the largest proportionate increase by far. Interestingly, the amount spent on district administration declines during this period while the amount of school administration increased, a topic we return to later in the paper.

Figures 3 through 5 show the percent change in expenditure level by expenditure category with districts grouped into: a) four size (enrollment) categories,[7] b) five expenditure level categories,[8] and c) three poverty categories.[9] As can be seen, the same basic pattern of allocation holds across the four size categories; districts spent proportion-

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[5] *Total Instruction Expenditure* includes "total current operation expenditure for activities dealing with the interaction of teachers and students in the classroom, home, or hospital as well as co-curricular activities. The activities of teachers and instructional aides or assistants engaged in regular instruction, special education, and vocational education programs." *Pupil Support* includes any expenditure that enhances instruction such as "attendance, social work, student accounting, counseling, student appraisal, information, record maintenance, and placement services. Medical, dental, nursing, psychological, and speech services are also included." *Instructional staff support* is composed of "expenditures for supervision of instruction service improvements, curriculum development, instructional staff training, and media, library, audiovisual, television, and computer-assisted instruction services." *District Administration* (General Administration) is any expenditure for the board of education and executive administration (office of the superintendent) services while *School Administration* is the expenditures for the office of the principal services. (Reference in F-33 Survey)

[6] The per pupil amount spent on district administration, school administration, pupil support services, and instructional support services all ranged between about $200 and $300 during the years studied. The total instruction expenditure per pupil ranged from $3,330 in 1991–92 to $3,622 in 1996–97.

[7] The size categories are: 200–2,500; 2,501–10,000; 10,001–25,000; greater than 25,000.

[8] The expenditure level categories are: less than $4,169; $4,170–$4,723; $4,724–$5,366; $5,367–$6,498; and greater than $6,498.

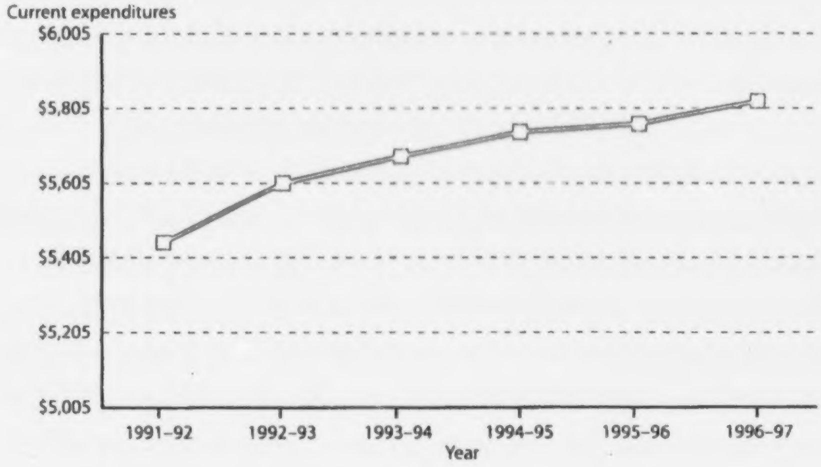
[9] The poverty categories are: less than 5 percent, greater than 5 percent–25 percent, greater than 25 percent.

Table 1.—Population characteristics

Characteristics	Percent	N	Characteristics	Percent	N
Enrollment			**Poverty**		
200–2,500	69.6	8,085	Less than 5.00 percent	13.7	1,594
2,501–10,000	24.5	2,843	5.01–25.00 percent	65.8	7,652
10,001–25,000	4.3	499	Greater than 25.00 percent	19.9	2,317
Greater than 25,000	1.7	195	Missing	0.5	59
Mean	3,515.6		Mean	16.8	
Region			**IEP**		
Northeast	20.7	2,400	Less than 6.69 percent	19.6	2,279
Midwest	37.8	4,398	6.70–9.65 percent	19.8	2,297
South	25.0	2,910	9.66–11.56 percent	19.7	2,287
West	16.5	1,914	11.57–14.00 percent	19.6	2,281
			Greater than 14.00	19.7	2,292
			Missing	1.6	186
Urbanicity			Mean	0.1	
Urban	8.0	929			
Suburban	17.5	2,030			
Rural	74.5	8,663			

SOURCE: U.S. Department of Education, National Center for Education Statistics. Common Core of Data, "National Public Education Financial Survey," 1991–92 through 1996–97 and U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33)," 1991–92 through 1996–97.

Figure 1.—Total current expenditure per pupil, 1992–97



NOTE: $N = 11,622$

SOURCE: U.S. Department of Education, National Center for Education Statistics. Common Core of Data, "National Public Education Financial Survey," 1991–92 through 1996–97 and U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33)," 1991–92 through 1996–97.

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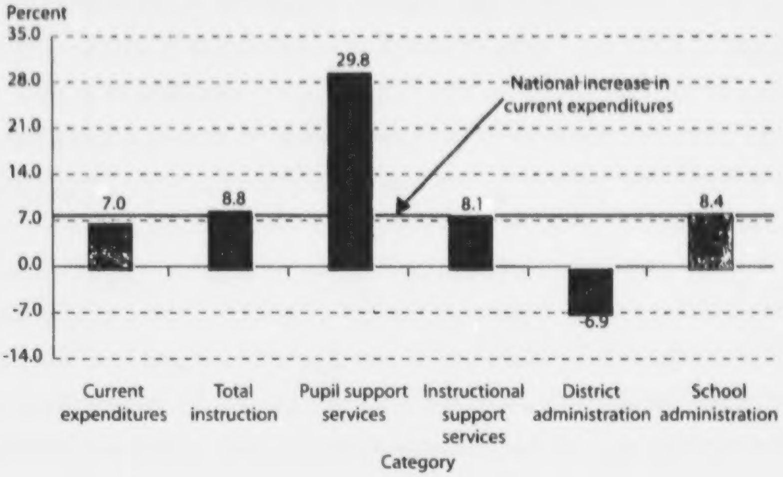
Figure 2.—Percent change in expenditure level, by category, 1992–97



SOURCE: U.S. Department of Education, National Center for Education Statistics. Common Core of Data, "National Public Education Financial Survey," 1991–92 through 1996–97 and U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33)," 1991–92 through 1996–97.

ately less on district administration and considerable more on pupil support services.[10] While all four groups invested only marginally more in instruction, the larger districts tended to increase spending in instructional support services at a higher rate.

The general allocation pattern was, for the most part, also similar for districts across different current expenditure levels—the largest increases were in pupil support services and decreases were in district administration. The one exception is that the lowest spending districts increased, rather than decreased, district administration. With the exception of the highest spending districts, increases tended to be proportionately greater for instructional support than for total instruction[11] and to be greatest, on average, for districts with the lowest overall current expenditures. Indeed, the highest spending districts decreased their expenditures in instructional support.

The same general patterns also held across districts with different levels of poverty. In terms of instructional support services, districts with populations with higher levels of poverty increased spending on instructional support services proportionately more than districts serving the most affluent populations, though the level of spending on instructional support for these affluent districts was still greater than those of other districts, on average.[12]

The results overall show a pattern that is somewhat surprising. During the period of reform that we analyzed, districts nationally were making only marginal increases in the fraction of spending going to instructional areas. Increases in instructional support services, however, were somewhat greater for the lowest spending districts and districts serving poorer populations. The largest proportionate increases in spending were in pupil support ser-

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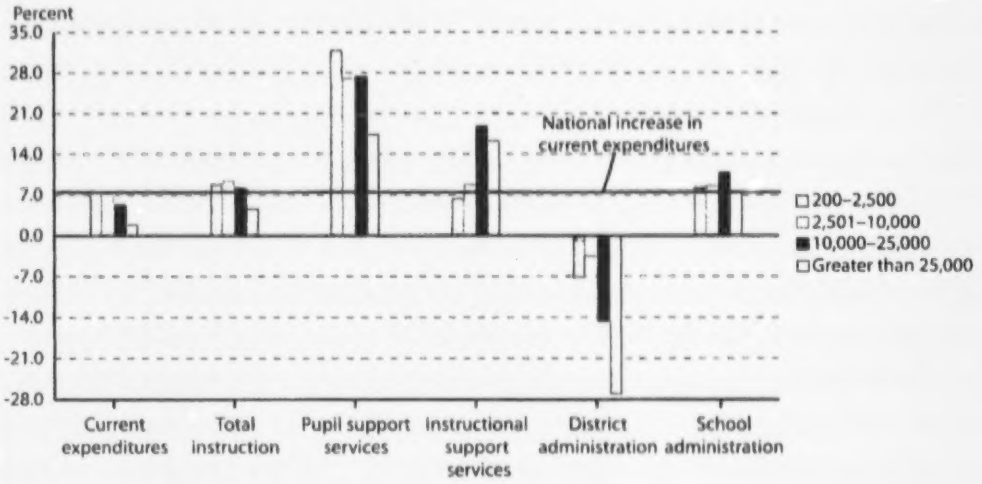
[10] Note, however, that the smaller districts spent proportionately more on pupil support services and showed smaller proportionate decreases in district administration. This may be due to a lag factor, i.e., that smaller districts have less resource flexibility at any given time and, as a consequence, adjust to demands more slowly than larger districts.

[11] Because the amounts spent on instruction ($3,330 in FY92) are so much greater than the amounts spent on instructional support ($185 in FY92), small amount of additional instructional support can result in a large proportionate increase.

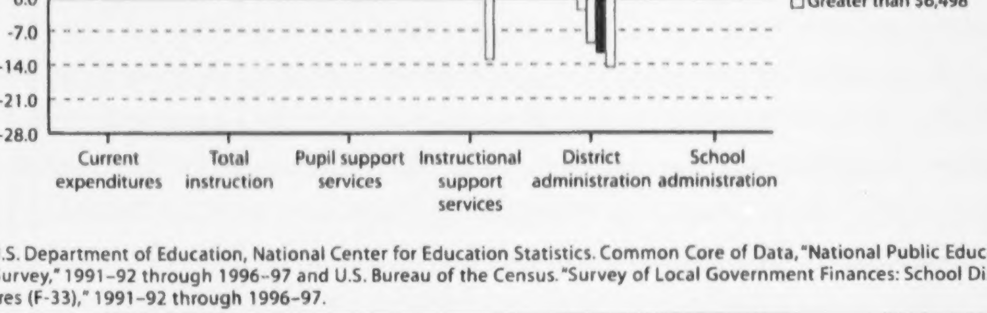
[12] In 1997 the most affluent districts, on average, spent $246 per pupil on instructional support while the moderate poverty districts spent $190, and the districts with the highest poverty levels spent $200 per pupil.

Figure 3.—Percent change in expenditure level, by category and by district size, 1992–97



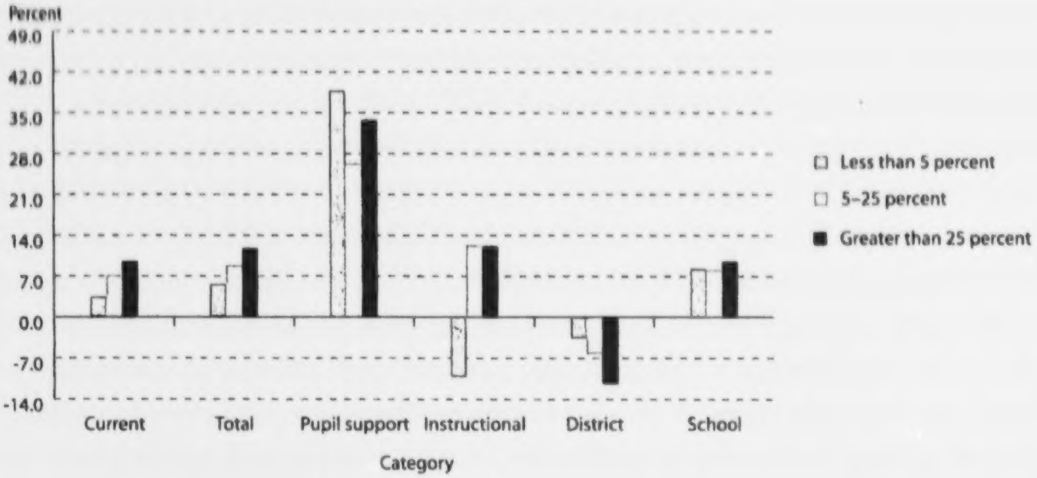
SOURCE: U.S. Department of Education, National Center for Education Statistics. Common Core of Data, "National Public Education Financial Survey," 1991–92 through 1996–97 and U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33)," 1991–92 through 1996–97.

Figure 4.—Percent change in expenditure level, by category and by current expenditure (92), 1992–97



SOURCE: U.S. Department of Education, National Center for Education Statistics. Common Core of Data, "National Public Education Financial Survey," 1991–92 through 1996–97 and U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33)," 1991–92 through 1996–97.

Figure 5.—Percent change in expenditure level, by category and by percent poverty, 1992–97



SOURCE: U.S. Department of Education, National Center for Education Statistics. Common Core of Data, "National Public Education Financial Survey," 1991–92 through 1996–97 and U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33)," 1991–92 through 1996–97.

vices, expenditures no doubt driven by mandates associated with special education, not so much by standards and accountability reform. We also observed a decrease in district administration and an increase in school administration. This latter allocation is one that we might expect to be a consequence of reform. At least, it is reasonable to expect greater attention to management of "production units" when standards are raised and accountability is increased. It is important to point out that there were important constraints affecting the allocation patterns of school districts. One is the demands of special education which has been mentioned. A second is expenditures on employee benefits which increased sharply during the period under study,[13] no doubt related to increases in health care costs during the 1990s.

While the national patterns are somewhat instructive, reform policies vary greatly from state to state. In the next section, we look for a clearer assessment of the consequences of reform by estimating the effect of being in a high reform state on districts' resource allocation patterns.

The Picture in Reform States

We identified four states that were in the forefront of reform during the 1990s: Kentucky, Maryland, North Carolina, and Texas. These states were all implementing some form of a performance-based accountability system. All four states had standards and assessments in place by the early 1990s. In addition, they each had an accountability system that rewarded high achieving schools and districts in some way and established sanctions for low performing ones.[14]

While the reform emphasis was similar in the four states, they differed rather markedly in terms of their financial picture. Two of the states increased expenditures less than the national average and two increased them considerably more than the national average from 1991–92 to 1996–97. Figure 6 shows the percent change in expenditure levels for each of the states and the national average. As can be seen, Kentucky increased expenditure levels by over four times the national average and Texas increased expenditures at more than twice the national average.

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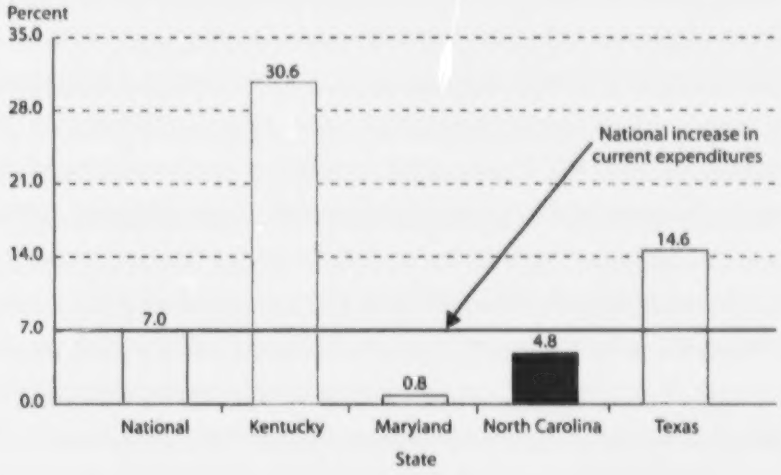
[13] Employee benefits increased nationally, on average, by 21.4 percent whiles salaries and wages increased by only 3.4 percent.

[14] For discussion of the reforms in these states, see Elmore, Abelmann, and Fuhrman (1996); Grissmer and Flanagan (1998); Massell (1998); and Hannaway and McKay (2001) as well as Education Week (1997).

Figure 6.—Percent change in current expenditure level, by reform state, 1992–97



SOURCE: U.S. Department of Education, National Center for Education Statistics. Common Core of Data, "National Public Education Financial Survey," 1991–92 through 1996–97 and U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33), 1991–92 through 1996–97.

Increases in Maryland and North Carolina were far more modest and considerably less than the national average.

Perhaps even more significant, as shown in figure 7, Kentucky and Texas increased investments in instruction particularly heavily during this period—more than four times the national average for Kentucky and almost three times the national average for Texas. (Kentucky and Texas spent less on instruction to begin with in 1992 and were still outspent by Maryland in 1997.[15]) It is interesting to note that while Kentucky increased expenditures in direct instruction markedly during this period, they decreased support services for instruction.

In the section below, we examine patterns of resource allocation using multivariate statistics. We are centrally interested in whether districts in the high reform states allocate resources differently from other districts, in particular, do they allocate resources more heavily to instruction during the period studied, after controlling for other factors.

Multivariate Strategy and Results

Strategy. The purpose of the multivariate analysis is to estimate the effect of being in a high reform state—Kentucky, Maryland, North Carolina, Texas—on the resource allocation patterns of districts while taking other factors into account. We are particularly interested in allocations to instruction, instructional support, district administration, and school administration. In general, we would expect districts facing new performance pressure to invest more heavily in instruction, and to put greater effort in managing activities at the school level, the locus of production.

We conducted the analyses by assigning a dummy variable to denote a district's location in each of the reform states. We ran separate regressions predicting the 1997 expenditures for each of four categories of expenditures: instruction, instructional support, district administration, and school administration. We included the expenditure variable for 1992 as an autoregressor so that our estimates

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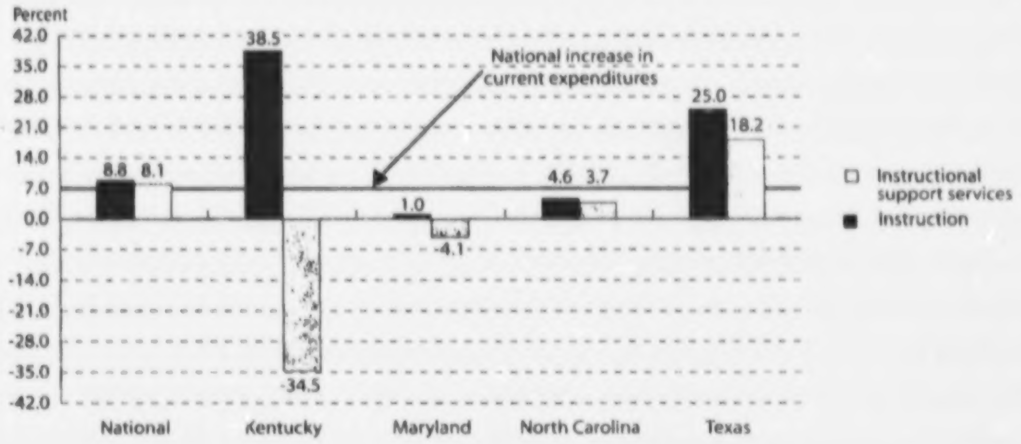
[15] The 1992 and 1997 instructional expenditure levels for each state were as follows: Maryland—$3,893, $3,930; Texas—$2,849, $3,562; North Carolina—$3,015, $3,155; Kentucky—$2,384, $3,303.

Figure 7.—Percent change in instruction and instructional staff, support services expenditure level, by reform state, 1992–97



SOURCE: U.S. Department of Education, National Center for Education Statistics. Common Core of Data, "National Public Education Financial Survey," 1991–92 through 1996–97 and U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33)," 1991–92 through 1996–97.

are based on spending over and above what was spent in the expenditure category in 1992. We also ran two sets of regressions, one in terms of levels of expenditure and the other in terms of shares of expenditures. The levels are represented in dollars expended; the shares are in terms of a percent of current expenditure.

The following variables were included as controls in the model: log of 1992 enrollment, percentage of children below poverty level; region (Northeast, South, Midwest, West); urbanicity (urban, rural, suburban); current expenditure (1992); and percent of enrolled IEP students.[16] We included the percent IEP because of the administrative and service burden associated with special education. Because the IEP data are missing Kentucky districts, the models were run with and without the IEP measure. We included the 1992 current expenditure to control for overall level of spending. We also included an interaction term composed of the dependent variable in 1992 with current expenditure in order to take into account that districts that were relatively high spenders may behave differently with regard to additional investment in that area than districts that were low spenders. Table 2 presents the summary regression results for the effect of each of the reform states. The full results are presented in the appendix.

Results. The results show that, even after controlling for a number of variables, two of the reform states—Kentucky and Texas—increased investment in instruction more than districts nationally during the period we analyzed. The two other states—Maryland and North Carolina—did not. A likely explanation for this finding that has important policy implications is that while reform is likely to have a major impact on resource allocation patterns, reform *alone* is insufficient for reallocation. As noted earlier, both Texas and Kentucky had sharp increases in funding during the period under study, suggesting that new money is a necessary condition for districts to disproportionately allocate funds into instruction. The pattern of findings for both level of expenditure and share of expenditure was the same.

At the same time, the results show that districts in high reform states do not invest disproportionately in instructional support services, even when there is new money in

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[16] We used the 1994 measure of IEP because it is the year for which we have the most complete data nationally.

Table 2.—Regression results—High reform states: Instruction, district administration, school administration, and instructional support services

	Instruction		District administration		School administration		Instructional support services	
Reform states	Level	Share	Level	Share	Level	Share	Level	Share
Kentucky	+	+	+	+	+	+	-	-
Maryland	ns	ns	ns	ns	+	+	-	-
North Carolina	ns	ns	ns	ns	ns	+	-	-
Texas	+	+	-	-	+	ns	-	-
N	11,562	11,562	10,642	10,642	10,892	10,892	10,926	10,926
Adj R-squared	0.83	0.45	0.62	0.62	0.75	0.45	0.45	0.33

+ Indicates positive significance.
- Indicates negative significance.
ns Indicates not significant.

SOURCE: U.S. Department of Education, National Center for Education Statistics. Common Core of Data, "National Public Education Financial Survey," 1991–92 through 1996–97 and U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33)," 1991–92 through 1996–97.

the system. To the extent there is additional investment, it appears to be in direct instructional services, not instructional support services.

The results also show that districts in high reform states increased spending on school level administration, over and above the general national trend for greater investment in this area. While we do not have data to provide a full explanation for this finding, it is likely related both to closer monitoring of school level efforts to improve student learning as well as to administrative costs associated with the reporting and accounting for results. There was no clear and easy explanation for the pattern for investment in district level administration in the reform states. Kentucky appeared to invest more heavily in district administration while Texas invested less. For Maryland and North Carolina, results were not significant.

Conclusion

This study examined whether school districts are allocating resources differently as a consequence of the standards and accountability reform movements which started to take root in the United States in the 1990s. We proceeded in two ways. First, we examined data over time for national trends. Surprisingly, districts did not appear to be investing more heavily in instruction during the period studied, as might be expected. Part of the explanation may be that school districts were confronted with demands for other types of expenditures, in particular spending on special education-related activities and employee benefits. National trends also showed a tendency to reduce administrative spending at the district level and to increase administrative spending at the school level.

Second, we estimated the effect of a district being located in a high reform state where performance pressure was particularly high. We identified Kentucky, Maryland, North Carolina, and Texas as states that instituted relatively strong standards and accountability reforms in the early 1990s. Our findings showed that districts in two of these states—Kentucky and Texas—disproportionately allocated resources to instruction in the period under study. The other two states did not. We suspect this may be due to the fact that Kentucky and Texas increased spending at the same time as they instituted reforms. In short, the finding suggests that reform alone may be insufficient to cause school districts to reallocate their resources. The findings also suggest that reform comes with an administrative burden; districts in reform states increased spending on school level reform over and above increases by other districts in the country.

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Appendix

Table 1.—Regression results for instruction expenditures

	Expenditure level		Expenditure share	
Variable	Including IEP	Excluding IEP	Including IEP	Excluding IEP
Intercept	*0.761 (0.046)	*0.832 (0.045)	*0.273 (0.006)	*0.282 (0.006)
Autoregressor	*0.576 (0.016)	*0.587 (0.016)	*0.549 (0.007)	*0.554 (0.008)
Reform state dummies				
Maryland	-0.012 (0.089)	-0.013 (0.089)	-0.0003 (0.007)	-0.0002 (0.007)
Texas	*0.413 (0.018)	*0.416 (0.018)	*0.042 (0.001)	*0.042 (0.001)
North Carolina	*-0.134 (0.042)	-0.072 (0.041)	*-0.007 (0.003)	0.002 (0.003)
Kentucky		*0.536 (0.034)		*0.023 (0.003)
Control variables				
Current expenditure, FY92	*0.141 (0.010)	*0.144 (0.010)	*-0.002 (0.001)	-0.001 (0.001)
Instruction expenditure current expenditure, FY92	*-0.0005 (0.001)	-0.001 (0.001)	0.0001 (0.0001)	-0.00005 (0.0001)
FY92 enrollment	*-0.008 (0.004)	*-0.009 (0.004)	0.0004 (0.0003)	0.0003 (0.0003)
Percent poverty	0.0001 (0.0004)	0.001 (0.0004)	*-0.0004 (0.00003)	*-0.0003 (0.00003)
Urban district	0.024 (0.016)	0.027 (0.016)	0.001 (0.001)	0.001 (0.001)
Suburban district	*0.056 (0.012)	*0.041 (0.012)	-0.0004 (0.001)	-0.003 (0.001)
Northeast region	*0.467 (0.018)	*0.445 (0.018)	*0.029 (0.001)	*0.027 (0.001)
Midwest region	*0.062 (0.014)	*0.031 (0.014)	*0.003 (0.001)	-0.002 (0.001)
West region	*-0.118 (0.015)	*-0.139 (0.015)	*0.015 (0.001)	*0.012 (0.001)
Percent IEP	*0.878 (0.086)		*0.131 (0.006)	
	N=11,376 R-Square =0.83	N=11,562 R-Square =0.83	N=11,376 R-Square =0.48	N=11,562 R-Square =0.45

* Indicates p-value < 0.05.

NOTE: Standard errors in parentheses.

SOURCE: Authors' calculations based on U.S. Department of Education, National Center for Education Statistics. Common Core of Data, "National Public Education Financial Survey," 1991–92 through 1996–97 and U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33)," 1991–92 through 1996–97 data.

Table 2.—Regression results for instructional support expenditures

	Expenditure level		Expenditure share	
Variable	Including IEP	Excluding IEP	Including IEP	Excluding IEP
Intercept	*-0.141 (0.008)	*-0.121 (0.008)	*-0.010 (0.001)	*-0.060 (0.001)
Autoregressor	*0.582 (0.015)	*0.554 (0.015)	*0.497 (0.010)	*0.462 (0.010)
Reform state dummies				
Maryland	*-0.038 (0.016)	*-0.037 (0.017)	*-0.007 (0.003)	*-0.007 (0.003)
Texas	*-0.009 (0.003)	*-0.009 (0.003)	*-0.004 (0.001)	*-0.004 (0.001)
North Carolina	*-0.048 (0.008)	*-0.034 (0.008)	*-0.008 (0.001)	*0.006 (0.001)
Kentucky		*-0.030 (0.007)		*-0.017 (0.001)
Control variables				
Current expenditure, FY92	*0.022 (0.001)	*0.024 (0.001)	*0.001 (0.0001)	*0.001 (0.0001)
(Instructional support) X (Current expenditure, FY92)	*-0.023 (0.002)	*-0.023 (0.002)	*-0.002 (0.0002)	*-0.002 (0.0002)
FY92 enrollment	*0.018 (0.001)	*0.017 (0.001)	*0.003 (0.0001)	*0.003 (0.0001)
Percent poverty	0.0001 (0.0001)	*0.0002 (0.0001)	0.00002 (0.00001)	*0.00003 (0.00001)
Urban district	-0.006 (0.003)	-0.004 (0.003)	*-0.001 (0.0005)	-0.001 (0.0005)
Suburban district	*-0.015 (0.002)	*-0.017 (0.002)	*-0.002 (0.0004)	*-0.002 (0.0004)
Northeast region	*-0.040 (0.003)	*-0.045 (0.003)	*-0.080 (0.001)	*-0.009 (0.0005)
Midwest region	0.004 (0.003)	-0.003 (0.003)	-0.001 (0.0004)	*-0.002 (0.0004)
West region	*-0.013 (0.003)	*-0.017 (0.003)	*-0.001 (0.0005)	*-0.017 (0.001)
Percent IEP	*0.190 (0.017)		*0.030 (0.003)	
	N=10,740 R-Square =0.47	N=10,926 R-Square =0.45	N=10,740 R-Square =0.34	N=10,926 R-Square =0.33

* Indicates p-value ≤ 0.05.

NOTE: Standard errors in parentheses.

SOURCE: Authors' calculations based on U.S. Department of Education, National Center for Education Statistics. Common Core of Data, "National Public Education Financial Survey," 1991–92 through 1996–97 and U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33)," 1991–92 through 1996–97 data.

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Table 3.—Regression results for district administration expenditures

	Expenditure level		Expenditure share	
Variable	Including IEP	Excluding IEP	Including IEP	Excluding IEP
Intercept	*0.323 (0.010)	*0.312 (0.010)	*0.060 (0.002)	*0.057 (0.002)
Autoregressor	*0.441 (0.013)	*0.439 (0.013)	*0.498 (0.009)	*0.500 (0.010)
Reform state dummies				
Maryland	-0.024 (0.017)	-0.024 (0.017)	-0.004 (0.003)	-0.004 (0.003)
Texas	*-0.137 (0.004)	*-0.137 (0.004)	*-0.029 (0.001)	*-0.030 (0.001)
North Carolina	0.016 (0.008)	0.008 (0.008)	*0.003 (0.001)	0.001 (0.001)
Kentucky		*0.078 (0.008)		*0.010 (0.001)
Control variables				
Current expenditure, FY92	*0.006 (0.001)	*0.006 (0.001)	-0.0001 (0.0001)	-0.0002 (0.0001)
(District administration) *X* (Current expenditure, FY92)	*0.008 (0.001)	*0.008 (0.001)	0.0001 (0.0001)	0.0001 (0.0001)
FY92 enrollment	*-0.033 (0.001)	*-0.033 (0.001)	*-0.005 (0.0002)	*-0.005 (0.0002)
Percent poverty	*0.001 (0.0001)	*0.001 (0.0001)	*0.0001 (0.00001)	*0.0001 (0.00001)
Urban district	*0.027 (0.003)	*0.027 (0.003)	*0.004 (0.001)	*0.004 (0.001)
Suburban district	*0.026 (0.003)	*0.028 (0.003)	*0.004 (0.0004)	*0.004 (0.0004)
Northeast region	*-0.044 (0.003)	*-0.044 (0.003)	*-0.009 (0.001)	*-0.009 (0.0005)
Midwest region	-0.004 (0.003)	0.0001 (0.003)	*-0.002 (0.0004)	-0.001 (0.0004)
West region	*-0.023 (0.003)	*-0.021 (0.003)	*-0.003 (0.0005)	*-0.003 (0.0005)
Percent IEP	*-0.114 (0.018)		*-0.025 (0.003)	
	N=10,456 R-Square =0.63	N=10642 R-Square =0.62	N=10456 R-Square =0.63	N=10642 R-Square =0.62

* Indicates p-value < 0.05.

NOTE: Standard errors in parentheses.

SOURCE: Authors' calculations based on U.S. Department of Education, National Center for Education Statistics. Common Core of Data, "National Public Education Financial Survey," 1991–92 through 1996–97 and U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33)," 1991–92 through 1996–97 data.

Table 4.—Regression results for school administration expenditures

	Expenditure level		Expenditure share	
Variable	Including IEP	Excluding IEP	Including IEP	Excluding IEP
Intercept	*0.066 (0.008)	*0.063 (0.008)	*0.026 (0.001)	*0.025 (0.001)
Autoregressor	*0.562 (0.013)	*0.565 (0.013)	*0.511 (0.009)	*0.514 (0.009)
Reform state dummies				
Maryland	*0.070 (0.015)	*0.069 (0.015)	*0.011 (0.002)	*0.011 (0.002)
Texas	*0.011 (0.003)	*0.010 (0.003)	-0.001 (0.0004)	-0.001 (0.0004)
North Carolina	*0.015 (0.007)	0.012 (0.007)	*0.004 (0.001)	*0.004 (0.001)
Kentucky		*0.051 (0.006)		*0.004 (0.001)
Control variables				
Current expenditure, FY92	*0.011 (0.001)	*0.010 (0.001)	*-0.001 (0.0001)	*-0.001 (0.0001)
(School administration) *X* (Current expenditure, FY92)	*0.003 (0.001)	*0.003 (0.001)	*0.0008 (0.0001)	*0.001 (0.0001)
FY92 enrollment	*0.003 (0.001)	*0.003 (0.001)	*0.001 (0.0001)	*0.001 (0.0001)
Percent poverty	-0.0001 (0.0001)	-0.0001 0.0001	*-0.00003 (0.00001)	*-0.00004 (0.00001)
Urban district	0.001 (0.003)	0.001 (0.003)	-0.0001 (0.0004)	-0.0001 (0.0004)
Suburban district	*0.015 (0.002)	*0.016 (0.002)	*0.001 (0.0003)	*0.001 (0.0003)
Northeast region	*0.015 (0.003)	*0.015 (0.003)	-0.001 (0.0004)	-0.001 (0.0004)
Midwest region	*0.005 (0.002)	*0.006 (0.002)	*0.001 (0.0003)	*0.001 (0.0003)
West region	0.001 (0.003)	0.001 (0.003)	*0.004 (0.0004)	*0.004 (0.0004)
Percent IEP	*-0.037 (0.015)		-0.004 (0.002)	
	N=10706 R-Square =0.58	N=10892 R-Square =0.58	N=10706 R-Square =0.45	N=10892 R-Square =0.45

* Indicates p-value < 0.05.

NOTE: Standard errors in parentheses.

SOURCE: Authors' calculations based on U.S. Department of Education, National Center for Education Statistics. Common Core of Data, "National Public Education Financial Survey," 1991–92 through 1996–97 and U.S. Bureau of the Census. "Survey of Local Government Finances: School District Expenditures (F-33)," 1991–92 through 1996–97 data.

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School Finance Litigation and Property Tax Revolts: How Undermining Local Control Turns Voters Away from Public Education

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Introduction

I argue in this essay that a local property tax system provides a political and economic framework that guides voters and school officials to select a more efficient level of public education than a largely state-funded system does. Court decisions that have undermined reliance on the local property tax, such as California's *Serrano v. Priest*[1] decisions, have invariably further centralized the funding and administration of public schools. This trend has undermined political support for education by divorcing voters' property tax payments from the quality of their local schools. The more extreme court decisions have, when sedulously followed by state legislatures, caused property tax revolts and other political reactions that have further undermined all public schools in the state. The quality of public education in the United States has most probably gotten worse, not better, because of these court decisions.

This essay is written for policymakers, attorneys and scholars who have a special interest in school finance reform litigation but do not have much training in economics. The approach I take invokes a standard analysis in the field that is called "local public economics" or "local public finance." I have a point of view about this issue; I am not shy about stating that many courts have done their states a great disservice by jumping into this area. But I am attempting to be evenhanded in my assessment of the economics and related social science literature. I will note areas where knowledge is uncertain and especially contested, and much of the work I describe is relatively recent, so that it has not been fully tested in the scholarly marketplace for ideas. Enough is known, however, to draw some conclusions that, I believe, ought to give pause to those who would rush to the courts to change the system of property tax financing for public education.

The Special Appeal of Educational Equality

Jonathan Kozol's *Savage Inequalities* (1991) is required reading in almost every education-reform course in American colleges and universities. It is an account of his visits to selected public schools around the United States in

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[1] Citations for court cases are listed following the references.

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the period 1988–1990.[2] Kozol's method was not random selection. He singled out especially problematic schools in poor, mostly minority, inner city areas and compared them to especially good public schools in rich, mostly white, suburban areas. His conclusions confirm Mae West's aphorism: rich is better.

Kozol was not simply trying to demonstrate what makes for good schools on his American journey, though. He wanted primarily to prick the conscience of his readers by showing the deplorable conditions in selected inner-city schools. Much of his criticism was directed at the lack of resources for education in poor areas. Like many others before him, he believed that the source of this poverty was the American system of local financing of schools, which, he argued, allows the rich to spend mainly on their own children and neglect the poor.

His argument strikes a sympathetic chord among many Americans. Even though local funding is now exceeded in aggregate by state and federal funding, which has contributed to equalization of expenditures, there remains considerable variation in spending per pupil within most states and (especially) among the states themselves.[3] This Kozol finds intolerable, and he has many sympathizers. Among the numerous values that Americans are said to hold is a belief in equality of opportunity. The differences in income and wealth that characterize a free-market economy are more acceptable if they result from a race in which everyone starts from the same gate. Another sports metaphor, that of "a level playing field," is often applied to the need for an equally good education by all participants in American society.

This view is the basis for slow-moving but powerful movement within the state courts. The California Supreme Court was the first to insist on statewide funding equality. Spending per pupil from publicly supplied funds, excluding special categories such as special-needs students, has become highly equalized in California. The cause of this equalization is the California Supreme Court's decisions in *Serrano v. Priest* in 1971 and 1976.[4] As a result of these decisions, about 95 percent of California public school students attend schools in districts whose per pupil revenues from property taxes and state taxes vary by no more than about 5 percent. All school taxes, including those raised by nominally local property taxes, are allocated by the state within this constraint. (As I shall describe in the section "How School Finance Equalization Caused a Taxpayer Revolt," Proposition 13, California's 1978 tax revolt, reduced the amount of property taxes that the state had to work with, but the command to equalize school resources stems from *Serrano*, not Proposition 13.)

Serrano remains a lodestar for lawyers challenging education funding in their state courts, and it is cited by most of the decisions that have favored these challengers. Relying on what even sympathetic observers regard as vague language in their constitutions,[5] at least 17 state courts have since 1971 held that their school systems rely excessively on local property taxation to fund primary and secondary education.[6] The courts have found fault with inequalities among local school districts in tax bases, tax rates, and spending per pupil.

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[2] Kozol had earlier tried out his method of visiting schools and interviewing children and teachers on his visits to Cuba in 1976 and 1977. In his account of this, *Children of the Revolution*, Kozol (1978) had nothing but praise for Cuba's schools and its adult literacy program, although he admits that he was never without a Cuban-government guide and translator on any of his visits.

[3] Numerous studies have compared the extent of inequality of expenditures within individual states (e.g., Riddle and White 1993). The recent trend is towards more equality of expenditure within states, though the trend is quite uneven among states (James Wyckoff 1992). Evans, Murray and Schwab (1997a,1997b) argue that much of the recent equalization has been accomplished by state court decisions, and the largest source of inequality in school spending is now differences among states rather than within states. Caroline Hoxby (1998b) shows that most of the inequality in education finance in this century has followed from inequality in income and wealth generally rather than sorting of the wealthy into separate districts.

[4] An excellent overall account of the California events discussed in this essay is given in Peter Schrag (1998). For a compact history of California school finance, see Lawrence Picus (1991).

[5] Julie Underwood (1994) shows that constitutional language in most state constitutions does not by itself warrant judicial intervention. Molly McUsic (1991) sees somewhat more in the language of the state constitutions, but her analysis shows that courts do not seem much bound by it. A similar conclusion is reached by Jonathan Banks (1992). A recent dissection of the Vermont Supreme Court's decision by a law professor who is sympathetic with its aims concluded that the opinion was completely at odds with the state's constitution and its history (Peter Teachout 1997). I regard the judicialization of public school funding as a political event of some interest, and I have criticized it in other places (Fischel 1998) but my primary task in the present essay is to examine the school finance movement's economic assumptions and consequences, not to analyze the basis for the courts decisions themselves. For my first pass at the latter issue, see Campbell and Fischel (1996), which demonstrates that the courts are *not* acting on behalf of a supposedly equalitarian majority that is frustrated by legislative gridlock.

Court decisions in the 1970s invoked the constitutional language of equality. However, the precise constitutional basis for *Serrano*, the equal protection clauses of the state and federal constitution, is no longer influential (Henke 1986). This is largely because the U.S. Supreme Court in the 1973 case of *San Antonio v. Rodriguez* decided that the use of local property taxation to finance education did not offend the U.S. Constitution's equal protection clause. The U.S. Court did not prohibit the states from deploying their own equal protection clauses, but state courts have been leery of doing so. They have instead more often invoked the notion of an "adequate" education for all students under state constitutional provisions that use open-ended terms like "thorough and efficient" education.

Despite the changing constitutional classifications, all of these court decisions have resulted in a substantial shift away from local property taxation and toward funding collected by (and controlled by) the state legislature.[7] This shift has also reduced the disparities in spending by districts within individual states, although the compression is sometimes only temporary. It has also shifted the balance of power from local school districts to state legislatures, most of which did not actively seek the added authority.

The other appeal to fairness that arises in the school finance litigation is the inequality of property taxes among districts.

For the most part, these judicial decisions have been praised in law journal articles as paradigms of state-level judicial activism. See, e.g., Jonathan Banks (1992), Wesley Horton (1992), and *Harvard Law Review* (1991).[8] The advocates of the litigation believe that persistent pressure by the courts is necessary to have a system that is both high in quality and promotes equality of educational opportunity. Jonathan Kozol has written approvingly of these lawsuits and even submitted a brief for the plaintiffs in the Massachusetts case of *McDuffy v. Secretary* (1993).

The other appeal to fairness that arises in the school finance litigation is the inequality of property taxes among districts. The paradigmatic case here is still the original pair that served as the poster children of the *Serrano* litigation. Beverly Hills could raise more than twice as much revenue per student from its tax base as poor Baldwin Park (another Los Angeles suburb), even though Baldwin Park had twice as high a local tax rate. Is it fair, the plaintiffs asked, that the "accident of geography" of living in one place or another should make such a difference in tax rates as well as in school expenditures?

The idea still resonates with courts more than 25 years after *Serrano*. The Vermont Supreme Court ruled for the plaintiffs in its 1997 *Brigham v. State* decision without benefit of a trial, holding that the mere facts of unequal spending and unequal tax rates rendered the state's system of school finance unconstitutional. The New Hampshire Supreme Court was similarly impressed by inequalities in tax rates in *Claremont v. Governor* and ruled that a reformed system must fund basic education expenditures from a tax whose rate does not vary across the state's school districts.

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[6] I do not plan to review the court decisions in any detail. For a useful compendium of cases, see Peter Enrich (1995, 185–194). By my accounting of Enrich's cases, there were 14 states in which the plaintiffs obtained a final court ruling that required more uniform state funding for schools. Several of the decisions were reversals of previous decisions that had upheld the current system. Since 1995, New Hampshire, Ohio, and Vermont have joined the fold.

[7] Bahl, Sjoquist, and Williams (1990) demonstrate the shift away from local financing to statewide financing following *Serrano*–style decisions. See also G. Alan Hickrod et al. (1992). Plaintiffs in recent cases have insisted that "adequacy" and "equality" are the same thing, and courts ruling in their favor have come to a similar conclusion. See, e.g., *Claremont v. Governor* (NH 1997), which applied an "adequacy" standard but insisted on uniform statewide standards and taxes to fund it. See also Peter Enrich (1995, 128–143), who insists on a difference between the adequacy and equality standards but notes that most courts regard them as requiring the same remedies.

[8] Increased activism by state courts on this and other issues was pressed by Supreme Court Justice William Brennan (Brennan 1986, Kahn 1996). California Supreme Court Justice Stanley Mosk (1988) proudly mentions *Serrano* as an example of the new state court activism. Cautionary notes by law professors such as Paul Carrington (1973) were few, but the seemingly endless litigation that the cases have promoted has induced at least a few members of the academy to express doubts about either the legitimacy or the efficacy of state court activism in this area (Heise 1994, Kahn 1996, McMillan 1998).

This second issue—tax fairness—is more easily dealt with than the issue of differences in educational opportunity that Kozol raises. It is simply wrong on virtually every account. Unequal tax rates and tax bases are not themselves indicators of unequal economic burdens. This requires, however, an understanding of a complicated-sounding but fundamentally simple idea called tax capitalization. Failure to understand this has needlessly complicated and often frustrated attempts to improve the quality of education for children from disadvantaged families as well as for the nation as a whole.

The subsequent plan of this essay is to develop the theory that underpins what I regard as the good things about decentralized, local control of school spending and property taxation. I will first develop the theory (the Tiebout model and capitalization). The evidence for the operation of this model is then reviewed. Capitalization is among the most widespread economic phenomenon in the local public sector, though its exact parameters are still subject to some debate. Then the implications of the model are explored in the light of empirical evidence. In brief, these are:

- The property tax is not unfair even if there are wide variations in bases and rates.
- Highly centralized school finance systems seem to produce worse educational outcomes on average, with no apparent gains to the poor.
- Court-ordered centralization can undermine political support for the entire fiscal system and has caused both explicit and implicit tax revolts.

In his 1956 article, Tiebout argued that a system of local governments could thus overcome the one-size-fits-none problem of pure public goods.

A Little Theory: Tiebout and Capitalization

Few of us get the level of national defense we really want. It's too much or too little; too aggressive or too dovish; too missile intensive or too land-mine intensive. The reason is that national defense is what economists call a pure public good: The level of the good has to be the same for everyone. The bombs bursting in air do so on behalf of all Americans. As a result, it won't do for New York to have one defense policy and Illinois to have another. Aside from possible conflicts between the states, many might shirk from providing much defense expenditures at all, relying on their neighbors' efforts to repel foreign threats. The founders of our republic understood the adverse consequences of this from hard experience, and they took pains to be sure that the national government would have the authority to raise an army and a navy, with the U.S. President as sole commander in chief.

So we are stuck with national defense and the problems of a monopoly provider—the Defense Department—of military services. But that's not true for the many other public services that can be varied geographically. There is no reason for schools or fire protection or police or snowplowing or parks or beaches to be uniformly provided everywhere. The economics of this insight, which has been apparent as a practical matter to Americans for hundreds of years, were first developed in 1956 by a young economist named Charles Tiebout (Tiebout 1956).[9]

Tiebout's enduring insight was that people can register their political preferences for geographically diverse public services by "voting with their feet" as well as by voting in a ballot box. If families can choose among a variety of communities, each with independent powers to tax, spend, and regulate, they will choose the one whose combination of housing and public services is the best match for themselves. In his 1956 article, Tiebout argued that a system of local governments could thus overcome the one-size-fits-none problem of pure public goods. Defense and control of the currency may inevitably be national, but Tiebout offered a compelling reason for allowing many other public goods to be provided locally. Allowing people to sort themselves out allows them to find the best mix of local public services, much as high-school seniors sort themselves out by going to college in different geographic areas.

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[9] His paper has become the touchstone of local public finance, and expositions and extensions of it can be found in virtually every textbook on public economics. See, e.g., Musgrave and Musgrave (1989).

An important amendment to Tiebout's model was developed by Bruce Hamilton (Hamilton 1975, 1976).[10] He pointed out that communities would need to use zoning to protect their local services from overcrowding by land uses which would not pay their full tax costs. If zoning can properly discriminate among the sources of municipal costs, Hamilton argued, the much-maligned property tax becomes simply a fee for local services. The tax is still a compulsory payment within the community, but all those who reside in the community have moved there with a clear understanding that their tax payments are matched up with the public services they expect.

I have argued in several works that most American metropolitan areas (and many rural areas as well) have enough governments, which in turn have enough zoning authority, to make the Tiebout-Hamilton model work tolerably well (Fischel 1985, chap. 14; 1981; 1992).[11] Homebuyers in most metropolitan areas can choose among dozens (sometimes hundreds) of local governments, including about as many school districts. When conservative libertarians speak of "the public school monopoly," they perhaps have in mind some large cities from which people with few economic resources can escape. For the vast majority of other metropolitan-area residents, and for most rural residents, there are usually scores of different school systems from which to choose.

> *Homebuyers in most metropolitan areas can choose among dozens (sometimes hundreds) of local governments, including about as many school districts.*

Tiebout's theory did not immediately take hold of the economics profession. The reason is not difficult to imagine. Clever theory, one can hear his readers saying, but who ever heard of people moving from town to town just to take advantage of the local schools? The answer was, plenty of people. Wallace Oates (1969) found this out by proposing a test of the Tiebout model. If enough people behaved as Tiebout supposed them to, shopping for towns as well as for individual houses, then the price of homes in communities with lower taxes or better services should reflect the net value of such advantages.

Only a few families, of course, actually get up and leave their community because they don't like their child's first-grade teacher. (One of the few, ironically enough, was John Serrano, the lead plaintiff in *Serrano v. Priest*, whose family left East Los Angeles for Whittier after the principal of the school John, Jr., was about to enter admitted it was not a good match for their "near gifted" child.[12]) Most people shop for a community when some life event causes them to move: they graduate from college, get a new job, get married, have children, or retire. At such times it is nearly costless to think about the qualities of the community as well as those of the house itself. Oates's idea is a commonplace among real estate sales people. They are so accustomed to potential buyers asking about the taxes, the schools and other community characteristics that most realtors preemptively post such information on the listing sheets of the houses they have for sale.

Oates, however, wanted to get a more systematic estimate of how much various characteristics were valued. He used a theory called hedonic prices (which simply proposes that the value of a complex good like a house is the sum of the values of its characteristics) and a statistical technique called multiple regression analysis to determine the contribution that community characteristics, such as school quality and tax rates, made to the value of housing in each community. Because his statistical test is crucial to the argument in the present work, I will describe it and the methods in some detail using an even simpler (but more current) example.

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[10] Hamilton regards his second article as the more definitive statement of his theory. He shows there that communities need not have uniform incomes or housing types to get the result that each home pays its own way. The only constraint is that there be some limit on each types of housing so that its foreseeable supply is fixed.

[11] The last article (Fischel 1992) is my most compact assemblage of evidence in support of the applicability of the Tiebout-Hamilton model.

[12] *Los Angeles Times*, December 31, 1976, § I, p. 3. Young John was reported to have prospered in school after the move. The apparently middle-class Serranos—John senior was a social worker—agreed for ideological reasons for their son to be the lead plaintiff in the suit, which was part of a national campaign by reform-minded lawyers funded by foundations and federal grants (Lee and Weisbrod 1978, 335).

An Econometric Test for Capitalization

Oates tested his theory by examining house values in northern New Jersey municipalities using data taken from the 1960 census. My example of Oates's study is one I undertook for the state of New Hampshire, which had retained me in 1995 as a consultant in its school finance case.[13] I undertook the study to demonstrate for the state that school taxes and school quality (as measured by test scores) were capitalized in the value of owner-occupied homes.

By "capitalized" I mean nothing more than that anticipated benefits and costs that accrue to community residents affect the market value of housing in a systematic way. Good news—like lower tax rates—causes the price of houses to increase, while bad news, such as declining test scores in the local schools, causes the price to decrease. Community tax rates and test scores are thus said to be capitalized in individual housing prices. Capitalization is the same phenomenon by which news of greater expected earnings raises the price of a company's stock and news of unfavorable future conditions lowers the price of the stock. The arithmetic of capitalization is complicated for most people because it involves discounting future benefits and costs to present values.[14] But it is not necessary to do any of this arithmetic to get a reasonable understanding of this important concept. Indeed, I have found that, once I explain the basic idea, most people say, of course, how could anyone think otherwise?

I will describe the study I undertook to show that taxes and school district characteristics *systematically* influence ("are capitalized in") housing prices. In order to do a statistical study, one needs a random sample of observations that display the characteristics one is interested in. My sample consisted of the 73 New Hampshire towns and cities whose population was at least 2,500 in 1990 and which were not part of an elementary-school cooperative school district. (Co-ops mix the finances of towns in ways that are difficult to match with each towns' demographic data.) The sample accounts for about three-quarters of the state's population.

The statistical technique for examining this sample is linear regression, which is also called "ordinary least squares" because of its technique of fitting a line such that the squared distance of each observation from the line is minimized.[15] In this method, variations in the ***dependent variable*** (the 1990 median value of owner-occupied homes in a district) are accounted for by variations in independent variables. The ***independent variables*** (those upon which the dependent variable depends) in the regression are:

> *tax rate* = the school tax rate per $1000 of equalized value for the town for the school year 1990–91. (Equalized value is the state's estimate of the market value of property, which it uses for comparative purposes to distribute state aid.)
>
> *test score* = the sum the two major elements of each town's scores on New Hampshire's uniform statewide achievement test given to fourth-graders in the school year 1990–91.
>
> *rooms* = median number of rooms in owner-occupied houses in 1990.
>
> *miles north* = straight-line distance in miles from the town to a single point in the northern suburbs of Boston (approximately at the intersection of I–93 and I–95).
>
> *house age* = median age in years of houses in the community in 1990.

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[13] The case was *Claremont v. Governor* (1997). The complete report from which the capitalization regression is taken, which includes the sources of data and the data themselves, is available from the author at Bill.Fischel@Dartmouth.Edu or on the Web at http://www.mainstream.net/nhpolitics/wf/essay.shtml.

[14] I undertook to explain to attorneys the mathematics of discounting in a 1991 paper that some lawyers have told me was helpful in understanding the arithmetic (Fischel 1991).

[15] More sophisticated regression methods would try to take into account the fact that some of my independent variables, such as tax rates, are defined using part of the dependent variable, house value, in the numerator. This could cause me to overstate the influence of tax rates on house values. For a general and exhaustive discussion, see John Yinger et al. (1988). At any rate, I offer this regression primarily as an example of the general statistical technique, and for that purpose I want to avoid expository complications.

Regression Results

Dependent variable: Median Value of Owner-Occupied Housing in 1990

Independent variable	Estimated coefficient	T-statistic	Variable mean
Tax rate	-2,685.23	-6.00	12.8509
Test score	229.8488	2.11	111.657
Rooms	41,331.6	12.37	6.105
Miles north	-373.885	-5.23	54.72
House age	-535.376	-2.57	27.287
Intercept	-77,034.1	-3.69	

(Mean value of dependent variable: $131,401.37)
Number of Observations: 73
R-Square: 0.86

The results of the regression show that the independent variables (including the intercept) account for 86 percent of the differences in home values among the communities in the sample. This is the interpretation of the figure labeled "R-Square," which is a commonly used summary measure of the "goodness of fit" of all of the independent variables. An R-Square of 0.86 indicates a very good fit. The highest possible value is 1.00, which is a perfect fit, and the lowest possible value is 0.00, which would indicate no relation at all between the independent variables and the median value of homes. (The intercept has no economic meaning in this regression; it is included only to determine the best overall statistical fit for the variables.)

The estimates show with a high degree of confidence that variations in school tax rates and test scores are capitalized in the value of owner occupied housing.

The "coefficients" are estimates of how much the independent variables affect home values. The "t-statistics," which are the ratio of the coefficient estimate divided by the "standard error of estimate" (a measure of how much each estimated coefficient varies from the actual observations), measure the confidence with which one can be sure that each coefficient is greater than zero. A coefficient with a t-statistic of about 1.95 or larger (in absolute value) is regarded as "statistically significant" in empirical studies. "Significance" in this context does not mean "important." It means only that if the same test were to be applied to a different sample (say another group of towns), we are pretty confident (odds of 19 to 1 or better) that the coefficient would again be different from zero in the direction that we predict. All of the coefficients in this regression are significant.

The variables most relevant to the present study are *tax rate* and *test score*. Their estimated coefficients, evaluated at the mean of the sample, imply the following: A one point increase in *test score* raises the value of a house by $229.85 and a one point increase in *tax rate* lowers the value of a house by $2,685.23. Both variables are highly significant and accord with those of many other studies. (The widely disparate numbers given here should not be disturbing. The mean of the variable *test score* is about 112, so a one-point increase is quite small. The mean of the variable *tax rate* is about 13, so a one-point increase is large.)

The estimates show with a high degree of confidence that variations in school tax rates and test scores are capitalized in the value of owner occupied housing. The degree of tax capitalization by this estimate is nearly 100 percent. A one mill (a mill is one-tenth of one percentage point) increase on the value of the sample's mean-value house ($131,401) would annually yield extra taxes of $131.40. If an interest rate of 5 percent is applied to $131.40 over an indefinite time horizon, the present value of the extra taxes is $2,628. This is 98 percent of the estimated coefficient ($2,685.23) on the tax rate variable, which implies that tax capitalization is almost complete. If the estimated coefficient had been only about $1,314, which is about half of what was found here, economists would say that the tax rate was only fifty percent capitalized. (More on the meaning of the degree of capitalization and the choice of interest rate and time horizon in the "How Extensive Is Capitalization?" section below.)

The remaining independent variables are included to control for other factors that influence each town's average housing values and which have been used in studies similar to this one. All of these variables are statistically significant and, as I will discuss, important in their effects on explaining average housing value variations among New Hampshire towns and cities.

The *rooms* variable is the median number of heated rooms, excepting bathrooms, of houses in the community. It is a measure of the size of the house. The coefficient indicates that at the mean of the sample, an additional room would add $41,331.60 in value to a house. This probably overstates the influence of rooms themselves, since larger houses are often on larger lots, which also add value to the property but for which no data are available from census sources.

The variable *miles north* (airline distance of the community from the northern outskirts of the Boston area) was negative and significant. It indicates that, other things equal, homes in the southeastern part of the state are more valuable than in the northern part. This accords with urban economics theory, which holds that people will pay more to live in places where there is a higher density of jobs and closer proximity to work. The southeastern part of New Hampshire is where most of the employment in the state is located, and it offers most convenient access to jobs and services in the Boston area. The large coefficient of -$372.89 per mile may also reflect the effects of the Boston area's unusual rise in prices in the late 1980s, which spilled over to southern New Hampshire.

The variable *house age* is a proxy for housing depreciation and obsolescence. Except for those with special antique appeal, older houses generally sell for less because they are worn out and require more maintenance. In this case, the estimate suggests that at the mean of the sample, an additional year of age subtracts $535.38 from the average house's value.

A Concrete Example of Tax Capitalization

The regression study that I described above was intended to show as simply as I can the nature of the econometric evidence in support of the capitalization of school taxes and test scores. But I have found that it helps to have something more graphic to get people to grasp the idea.

In preparing for my testimony in the New Hampshire school finance case, I asked some state officials if they could find some examples of the capitalization phenomena I had told them about. They told me that there was a street (Albin Road) in the outskirts of Concord, New Hampshire, that also went through the adjacent town of Bow, New Hampshire. A developer had apparently bought land all along this road and had built a set of houses of strikingly similar styles. The lots were the same size, too. But some were in Bow, and some were in Concord. I visited the road and had the state take pictures of the houses to make an exhibit.

Bow is a very small town in population. (Its land area is about the same as Concord's.) It has its own elementary school, but it sent its high school students to Concord High School. Within Bow is an electric-power generating plant, which pays a large fraction of Bow's property taxes. Thus the Bow tax rate is only about half of Concord's tax rate. The state officials I dealt with obtained sale prices for houses in this area. Several homes on both sides of the town line had sold within a few months of one another. We pasted the sale prices on the photographs of each house, and beneath them was the tax payment for each house.

The comparisons provided a stark and graphic confirmation of tax capitalization: Buyers of houses in low-tax Bow paid on average $16,000 more than buyers of nearly identical houses just a few hundred feet away in Concord. The higher taxes in Concord were compensated by the lower mortgage payment. Bow homebuyers, residents of a town often identified as "property rich," had paid for much of their privileged tax-status in advance.

Consider then what would happen if Concord High School (where children from Bow and Concord both went) built a new wing and apportioned the additional taxes on a per-student basis between Bow and Concord. Homeowners in Concord pay, say, $200 more in taxes. In Bow, the average homeowner pays only, say, $90 in additional taxes because the power plant is paying the rest. But if the additional school services are actually worth $200 more to the Bow residents, their houses will rise in value by the capitalized value of the $110 (that is, $200 in additional school benefits less the $90 in extra taxes). Hence the price that Bow residents pay for the extra school services is the same as it is in Concord. In Concord, the average taxpayer has to pay $200 in extra taxes to get $200 in extra school services. In Bow, the average taxpayer has to pay $90 in taxes and $110 in extra annual housing costs to get $200 in extra school services. To the extent that such a scenario was anticipated by those who sold them their homes, the current Bow residents have paid for it already. To the extent that it was unanticipated, only new buyers (after the new school wing is built) will actually pay for it. But in either case, the additional cost of the better schools is the same for the average taxpayer in both towns: $200.

There is one variation on this story that needs to be accounted for. I have deliberately held the level of public services (the schools) constant in these examples. What if the two towns had different tax bases and sent their kids to their own rather than a joint high school? To burnish this with realism, I learned that Bow has grown enough that it has decided to build its own high school and stop sending their children to Concord High.

I would expect that the new Bow High School will be a somewhat classier place than Concord High. The Bow power plant will disgorge its tax revenues only insofar as Bow voters are also willing to tax themselves. The power plant does not just hand each Bow resident, say, $1,000 each year. The Bow residents get the $1,000 subsidy only if they tax themselves at the same rate as the power plant and spend the resulting sum on public services. Thus the power plant's taxes amount to a subsidy to particular public services rather than a simple cash grant.

This means that all public services are likely to be a little better in Bow (at least to the extent that the power plant does not offset its tax contributions with greater need for public services). Current Bow voters may in this case face an apparently lower price for public services. However, because all future residents have to buy houses there, they must pay for this privilege in advance. It is not free for them. The economic well being of residents on the low-tax Bow end of Albin Road (the road along which I observed similar houses being sold for different prices) is no greater than that of residents on the high tax Concord end of Albin Road. It is true that the Bow residents will have a fancier school to go to, but Concord residents will have a lower monthly mortgage payment to compensate for that. Capitalization evens out the economic burdens of fiscal differences.[16]

It is true that the Bow residents will have a fancier school to go to, but Concord residents will have a lower monthly mortgage payment to compensate for that.

How Extensive Is Capitalization?

Capitalization studies are now so common that they are an undergraduate exercise. Students in my urban economics class routinely do term papers in which they use real-estate data to show how much taxes and indicators of school quality are capitalized. They are thereby replicating (with more limited samples and usually less sophisticated statistical techniques) the results of many published studies.

The pioneering capitalization study was that of Wallace Oates. After examining a 1960 sample of northern New Jersey communities, Oates (1969, 968) concluded that "if a community increases its tax rates and employs the receipts to improve its school system, the [statistical] coefficients indicate that the increased benefits from the expenditure side of the budget will roughly offset (or perhaps even more than offset) the depressive effect of the higher tax rates on local property values." Before one concludes from this that New Jersey communities were able to spend themselves rich by throwing money at schools, it must be pointed out that Oates assumed that the increased local school expenditures were perceived by parents (and homebuyers) as cost-effective.

Later studies that used samples from various parts of the country confirmed Oates's results of capitalization of school quality. Using a 1970 sample in San Mateo County, California, Jon Sonstelie and Paul Portney (1980a, 114) found that "The annual gross rent of our median house is increased by about $52 for each additional month of average reading improvement achieved by students in the elementary school district. Each additional dollar of per-pupil expenditures on elementary education increases the annual gross rent of the median house by more than 90 cents."[17]

Other studies found capitalization of per pupil spending within Toronto and in the Boston area (Bruce Hamilton 1979, Toronto area in 1961; Heinberg and Oates 1970, Boston area in 1959; and Larry Orr 1968, Boston area in 1959). Higher test scores were found to raise individual house values (not just for those who have children in the house) in Charlotte, North Carolina, the Boston area, Dallas, the Los Angeles area (before the *Serrano* decision) and in Ohio metropolitan areas (Jud and Watts 1981, Charlotte, NC; Li and Brown 1980, Boston area; Hayes and Taylor 1996, Dallas; Gerald McDougal 1976, Los Angeles area; and Haurin and Brasington 1996, Ohio metropolitan areas).[18] A recent study (Bradbury, Case, and Mayer 1995) found significantly greater housing values in Massachusetts towns and cities whose school spending and test scores increased more than average in the 1990–94 period.[19] Almost wherever economists have looked, they have found that better schools raise home values.

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[16] Moreover, as long as the Bow residents in fact would have been willing to pay for this combination of housing services and schools if they had been offered as independent goods, the supposedly lower tax-price of schools is not economically distorting (Ladd and Yinger 1994). Residents willing to pay for the fancier style of education offered (I am supposing) in Bow will settle there and pay the higher housing prices.

[17] See also Raymond Reinhard (1981), who applied an improved econometric method to the data from Oates (1969) and from Sonstelie and Portney (1980a) and found even larger capitalization effects from school expenditures and test scores.

The studies that show that anticipated *property taxes* are capitalized in home values are even more numerous. Fortunately for the reader's patience, many of these studies have been summarized in an important book by economists John Yinger, Axel Borsch-Supan, Howard Bloom, and Helen Ladd (Yinger et al. 1988, 11–47). They reviewed in detail 30 published studies of tax capitalization by professional economists. These studies used a variety of samples from states and metropolitan areas around the country in which property taxes were the main means of financing local schools. All but three of them show capitalization of property taxes. The studies showing significant capitalization examined samples of local governments in California, Connecticut, Kentucky, Missouri, Montana, New Jersey, New York, and Pennsylvania. Of the three that showed no capitalization, two used samples from Canada, whose tax laws differ in some places from those of the United States Tax capitalization has become so common now that it is hard to interest journal editors in additional studies.

> *It is almost universally agreed that, other things equal, a higher property tax will lower the value of housing and other property in the community.*

The Yinger book is a convenient compendium of studies and a guide to capitalization principles, but it also presents a challenge to the tax capitalization claim. It is almost universally agreed that, other things equal, a higher property tax will lower the value of housing and other property in the community. The remaining question is, how much? If the degree of capitalization is 100 percent (as my simple New Hampshire study suggested), then 100 percent of the differences in tax rates among communities is offset by other housing costs. The seeming $800-a-year tax break (relative to the mean of all communities) in a low-tax district is offset by an $800-a-year higher mortgage payment (or other cost of buying a home, such as giving up interest and dividends on other types of investment[20]) for the home buyer. If capitalization is only 50 percent, then the seeming $800-a-year tax break on the house in the low-tax district is offset by an extra $400-a-year mortgage payment.

The novelty of the Yinger book was that its authors undertook a serious, statistically sophisticated attempt to ascertain the exact degree of property tax capitalization in an active housing market. They had located what appeared to be an ideal sample from which to infer tax capitalization. In the early 1970s, Massachusetts required local assessors to revalue all properties at full market value. Up to that time, many communities had practiced a form of "welcome stranger" assessment. Assessments on preexisting homes were seldom adjusted for inflation in market value, but newly-built or greatly expanded homes were assessed at full market value. (The buyer of the newly built home was the "stranger" who paid more than her fair share of taxes, for which she was "welcomed" by other community residents.) This informal and illegal practice created a situation in which older homes often paid only a fraction of what newer but otherwise comparable homes were paying. Homes in the same community were getting the same services but were paying substantially different amounts in taxes.

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[18] Haurin and Brasington found that school quality was actually the most important determinant of variations in house values. For a survey of articles on schools and housing values, see Crone (1998).

[19] William Bogart and Brian Cromwell (1997) found that homebuyers in the suburbs of Cleveland were willing to pay substantial premiums—on the order of $5,000 to $10,000—to live in higher-quality school districts, even though such districts had higher tax rates.

[20] I generally use the term "mortgage payment" as a shorthand for all of the investment costs of buying and maintaining a home. People sometimes point out that many people have a large amount of equity in their homes and so do not perceive this cost. But this is mistaken; the more equity you have in your home, the more interest and dividends you are foregoing from bonds, stocks or other possible investments. To put it another way, a person who buys a $200,000 house for "cash" is foregoing all of the interest that the cash could have earned in some alternative investment. The possibility that the home will rise in value does not negate this argument, since one could have borrowed money to buy the home and still gotten the capital gain.

When state-ordered reassessment arrived in Massachusetts, however, the old homes had to pull their fiscal weight, and tax bills rose, while newer homes got a tax break.[21] As a result, the previously overassessed homes rose in value, while the underassessed homes fell in value, allowing the economists to match changes in tax liabilities with changes in home values. The key factor for the Yinger study was that total taxes and public services did not change within a given community. Only the distribution of tax liabilities changed. From this special sample, it was possible for the Yinger group to see how much home values had changed solely as a result of property tax increases and decreases.

The Yinger study found that there had been capitalization of tax advantages to underassessed homes in every community, but much less than they expected. In their best sample, only about twenty percent of the previous tax differences (which were wiped out by reassessment) had been reflected in the price of housing. A $300 annual tax break for a favored property should have resulted in a $10,000 value differential (using their infinite time horizon and a 3 percent discount rate). But in fact it yielded only about a $2,000 value differential. In this seemingly ideal experiment, very little capitalization took place.

...a tax differential that is expected to last a long time will be 100 percent capitalized.

The reason for incomplete capitalization in the Yinger study had nothing to do with the failure of participants in the housing market to notice tax differentials. The failure had to do with the original design of the study. On reflection, the authors of the Yinger study concluded that participants in the housing market had anticipated that the tax differentials would not be permanent. Homebuyers did not necessarily know that there would be a statewide mandate to reassess at market value. They simply did not think that such blatantly unfair (and illegal) assessment differentials would last for a long time. Thus the Yinger group's use of the infinite time horizon and a low "real" interest rate of three percent, which would be appropriate for a stable and very long-run situation, vastly understated the extent of capitalization, as they admitted in their conclusion.[22]

A subsequent study from California demonstrated that a tax differential that is expected to last a long time will be 100 percent capitalized. A clever study by A. Quang Do and C.F. Sirmans (1994) looked at homes in San Diego County in the 1980s that had been built by developers who had agreed to the terms of a "Mello-Roos" bond. This special bond (named for its legislative sponsors, not for laid-back marsupials) was designed to allow California communities strapped by the constraints of Proposition 13, the 1978 property-tax-limitation law, to finance new schools and other public infrastructure. (More on Proposition 13 below.) Because Proposition 13 did not allow the older homes (those built before the use of Mello-Roos) to be taxed more, the new homes had to bear the entire burden of building new schools through special taxes to finance the Mello-Roos bonds. But kids from the older homes could attend these new schools just like everyone else. Mello-Roos was the logical extension of the "welcome stranger" aspect of Proposition 13, which severely limited tax reassessments as well as tax rates on existing homes.

The Mello-Roos bonds were paid for by a tax on the new homes, not the old ones, but the public services were the same. Do and Sirmans found that the housing value differences between old and new housing was 100 percent capitalized at a 4 percent rate of interest applied over the

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[21] The reassessment order actually came from the Massachusetts Supreme Judicial Court, but the requirement for uniform taxation had long been in the state's constitution. On Massachusetts' property tax policy of this era generally, see Avault, Ganz, and Holland (1979). In 1978, voters approved a constitutional amendment that allowed differential taxation of commercial property, but this did not negate the rule of uniformity within the residential classification.

[22] Yinger et al. (1988, 143): "The degree of capitalization reflects household's expectations about future tax changes. In the Massachusetts case, variation in effective tax rates is caused by assessment errors and, because of much public debate about revaluation, households know that these errors will eventually be corrected. This type of expectation appears to be largely responsible for the incomplete capitalization of current tax differences."

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25 year life of the Mello-Roos bond. Because 4 percent is quite close to most other estimates of the "real" (inflation-taken-out) interest rate at the time, I take this study as evidence that a fully anticipated tax differential will, in an active local housing market, be fully capitalized. The reason for the difference between Do and Sirman's result and that of the Yinger study is that Yinger erroneously supposed (at least at the beginning of their study) that homebuyers in the Boston area thought the tax favoritism would last forever. It did not; the Massachusetts courts ordered reassessments, as was required by state laws that had been flouted in practice.

In California, the ultimate source of the tax differential was Proposition 13, an amendment to the California Constitution that has proved immovable since it was approved in 1978. Thus the homebuyers in Do and Sirmans' California sample could look at a $700 difference in taxes between two otherwise identical houses—one in the Mello-Roos district, and the other outside of it but in the same school district—and figure the difference in present value terms, which amounted to about $13,500. I conclude from this that persistent property tax differences among homes within the same housing market (the land area over which homebuyers can search) will be fully capitalized. To find less than full capitalization is for the most part to find that potential homebuyers don't expect the current annual differences in taxes to last very long, or to fail to account for other relevant differences among the communities, such as school quality.

The most obvious implication is that property tax rates do not, repeat, **do not** *measure the economic burden of the property tax system.*

Capitalization and Fairness

Economists have known about capitalization of both property taxes and school quality in home values for a long time. What has not been so widely understood is the implications of capitalization for school finance reform. The most obvious implication is that property tax rates do not, repeat, ***do not*** measure the economic burden of the property tax system. Virtually every court case that has overturned local financing of schools has treated property tax rates as if they were the same as personal income tax rates, in which variations in rates do normally mean variations in economic burdens. Local property taxes are just not the same. The claim that unequal tax bases and unequal tax rates are evidence of economic unfairness is wrong. Nearly all economists who have addressed the issue of capitalization of local fiscal differences concur.[23] Let's walk through the argument once again.

Two towns share a school system—a common situation in many small, rural New England communities and, I suspect, many other places. Each town taxes itself based on its own tax base, with the nearly invariable result that tax rates for schools are different. Is this unfair? Not if the houses in the lower-tax town have a higher price-tag than those of comparable quality in the high-tax town. In that case, the mortgage and other housing-related costs will soak up the difference. The person who buys in the low-tax town pays the same for the sum of his municipal services (which are schools in our example) and housing as the person in the high-tax town. It is just a matter of who you pay: In the high-tax town, you pay more of your money to the tax collector; in the low-tax town, you pay more of your money to the mortgage banker. The example I gave above that compared tax burdens in Bow and Concord, New Hampshire, illustrated the principle, which is the concrete manifestation of all of those statistical studies about capitalization.

Here's another analogy. Suppose there are two private boarding schools. Both require all students to live on campus. St. Grottlesex charges $15,000 tuition and $10,000 for room and board. The Saltpeter School charges $10,000 tuition and $15,000 for room and board. Both give their students the same education; maybe the style is different (Saltpeter uses resident advisors and so imputes that cost to room charges), but their graduates learn the same amount. If one looked only at the tuition—which is what, in a public-school world would determine average tax payments—St. Grottlesex must be more expensive. People might say, isn't it unfair that St. G's charges families more than Saltpeter's to send their kids there? But, since both schools require their students to be residents (as is also the case for public schools in most towns), the total cost of attending either school is the same. Looking at just the tax payment or the tax rate from which it is obtained, without looking at the housing costs, is akin to assuming that daylight savings time makes each summer day 25 hours long.

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[23] Aaron Gurwitz (1980, 316) concluded, "Only if there is no measurable capitalization do fiscal disparities constitute prima facie evidence of horizontal taxpayer inequity." Ladd and Yinger (1994, 218–219) said, "Full capitalization implies that the benefits to tenants from [equalizing] grant-induced increases in service quality are canceled by rent increases and that the benefits to homeowners are confined to people who currently own property in the community." For similar statements, see Downes and Pogue (1994); Bruce Hamilton (1976); Inman and Rubinfeld (1979); Paul Wyckoff (1995); Yinger et al. (1988, 135–143).

A group that supported the plaintiffs in the New Hampshire case had a clever public relations device that they called "the moving house." Priced at $100,000, the mock-building was moved on a trailer from town to town to show how much the taxes would vary.

In low tax Hampton, the taxes on the $100,000 house were obviously less than they would have been in high-tax Pittsfield. The exhibitors asked rhetorically, is it fair to allow such variations?

Capitalization shows the subtle fraud of such an exhibit. Capitalization says that when the house moves over the border, the house changes value: If the taxes in the town to which it moves are higher than the regional average, its value falls below $100,000. If the taxes are lower, it climbs above $100,000. What changes value, however, is not the structure itself but the land beneath it. This is what makes the moving house so fraudulent. It is the residential building lot that reflects the characteristics of the town. What housing-value capitalization is actually detecting is differences in improved or improvable land values.

> *Looking at just the tax payment…without looking at the housing costs, is akin to assuming that daylight savings time makes each summer day 25 hours long.*

"Property Rich" Places Are Often Populated by Poor People

The back-up rationale for demanding equalization of property tax rates is that it is a reasonable surrogate for helping the poor. Poor people live in houses that cost less than rich people, goes this story, so that pooling the resources of all communities will provide a benefit for the poor. The comparison in California's Serrano litigation of poor Baldwin Park and—need it be said?—rich Beverly Hills was calculated to raise that issue. The comparison of "property poor" communities to "property-rich" communities was easily transformed by such examples into a comparison of just plain "poor" and "rich" communities.

There are at least two reasons that this transformation from "property-poor" to just plain "poor" is wrong. The most obvious is that every study shows a very low—often negative—correlation between communities with high property wealth per pupil and communities with high median family income (the best single measure of its residents' personal wealth).[24] The reason for this is that nonresidential property, chiefly commercial and industrial property, often offsets the low personal wealth of the residents.[25]

The most obvious and important example of this offset is large central cities. Many such cities have both large amounts of commercial property and disproportionate numbers of poor people. In California, it was belatedly noticed and reported in the *Los Angeles Times* (June 30, 1974, § 1, p. 3) that the cities of Los Angeles and San Francisco, which harbor a disproportionate number of low-income people, were among the "property rich" places that were supposed to disgorge their local wealth in the name of school property tax equity. (This inconvenient fact led some advocates of school finance litigation to argue that such places cannot fund schools adequately because of a "municipal overburden" of commitments for other services. There is no evidence, however, that this condition—which is at least partly self-created—inhibits school spending.[26])

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[24] The poor correlation has been known ever since the suits have been instituted, but it has hardly affected the debate within the court system, despite its mention in the U.S. Supreme Court's *San Antonio v. Rodriguez* decision (See *Yale Law Journal* 1972 and Edward Zelinsky 1976). A study done for an earlier New Hampshire school finance case by Karen Negris (1982), a Dartmouth student working under my direction, found virtually no correlation ($r = 0.04$) between tax-base per capita and median family income in New Hampshire towns. California data in 1974 had shown that most of the states' poor children actually lived in districts with above-average property values. Jack McCurdy, School Funding Ruling: a Setback for the Poor? *Los Angeles Times*, June 30, 1974, § I, at 3. See also Joondeph (1995, nn. 26–28). The only claim to the contrary is by Inman and Rubinfeld (1979, 1,670), but their data to back this claim apparently were from a sample of suburban Long Island school districts in which Inman (1978, 62) noted that there were "trivially small poverty populations."

[25] Fischel (1976) demonstrates that commercial and industrial tax base is more likely to be in low-income communities in northern New Jersey, and Helen Ladd (1976) showed the same for Massachusetts.

Even among the suburbs and smaller towns, there is a tendency for the low-housing values of the poorer communities to be supplemented by larger-than-average amounts of commercial and industrial property. This is because higher-income people tend to be fussier about localized disamenities that emanate from higher concentrations of commerce and industry. They avoid places that have disproportionate concentrations of it, and they also use zoning to discourage its entry to their own communities.[27]

Even among the suburbs and smaller towns, there is a tendency for the low-housing values of the poorer communities to be supplemented by larger-than-average amounts of commercial and industrial property.

Paul Carrington, former dean of the Duke University Law School, passed this story along to me in a letter of March 11, 1997:

> Your footnote [in my "How Serrano Caused Proposition 13"] on the ambiguity of "wealth" brings to mind an experience of a Kansas lawyer that I know. Back in the days of Serrano, he was enlisted by the ACLU to attack the Kansas school finance system, which he agreed to do pro bono. After studying the matter, he observed that the richest district was Kansas City, which had the poorest children, while the poorest district was Pretty Prairie, a suburb of Wichita, which had the richest kids. He went back to his client and suggested the imprudence of their claim. They affirmed, however, that the principle of wealth redistribution was so important that the children of Kansas City would have to be sacrificed. He filed the suit, and the Attorney General of Kansas confessed judgment. He is still wondering why he did what he did.

There is occasionally some recognition of the idea that communities ought to be rewarded for putting up with unpopular land uses. Both Vermont and New Hampshire have a single nuclear power plant located within their borders. Both states have recently been subject to court orders to reduce reliance on local property taxes for school funding. Vermont has proceeded apace with a plan that expropriates some of the tax base of the "property-rich" towns. (One of the projected gainers from this system is Norwich, Vermont, which has the highest median family income in the state, but not much nonresidential property.) But the town with the nuclear plant, Vernon, Vermont, was specifically exempted from this provision. The major inducement for Vernon, a lower-income town, to accept the plant was that it would pay most of the town's taxes and thus compensate residents for the inconveniences and anxieties caused by the plant. A similar inducement helped the town of Seabrook, New Hampshire, also a low-income town, to accept a nuclear plant.

It has long been my contention that the placement of all less-than-lovely commercial and industrial establishments are subject to the same sorts of considerations.[28] Since the advent of comprehensive zoning in the 1910s, commercial and industrial establishments have needed the permission of local political authorities, and these authorities are in most places rather attentive to the home values of their constituents. "Accidents of geography," as the tax-base of localities are often described by the plaintiffs in school finance cases, are increasingly few and far between.

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[26] Brazer and McCarty (1989, 566) conclude that municipal overburden is a canard: "Evidence from several states shows consistently that there is no systematic negative relationship between school and non-school tax rates or expenditures."

[27] It is well established that high–income people are more inclined to support environmental legislation (Kahn and Matsuska 1997) and to oppose proposed heavy industry in their towns (Fischel 1979). Vicki Been (1994, 1,387) has demonstrated that the higher concentrations of poor people near environmentally problematic sites is caused by the poor moving to established sites rather than, as proponents to the "environmental justice" movement claim, the noxious use being deliberately placed near poor places. See also Been and Gupta (1997).

[28] This was the subject of my doctoral dissertation (Fischel 1975)—that the distribution of industry among localities is affected by zoning as well as tax policies is confirmed in empirical studies by Erickson and Wasylenko (1980), Erickson and Wollover (1987), William Fox (1981), and Warren McHone (1986). I expanded my idea of communities using zoning to manage commercial tax base into a more general theory of zoning to maximize property values in my book (Fischel 1985).

But one need not accept my theory of local government land-use determinism to reject the idea that residence in "property-rich" towns is an unsatisfactory base from which to redistribute wealth. Suppose the distribution of commercial and industrial property is entirely random, and accidental concentrations of it do confer a windfall advantage on the people who live there. Such advantages will be capitalized in the value of the homes of people who live there. When they sell their homes, the buyers will have to pay both for the home and for the privilege of the fiscal advantages of the community, whether they be low taxes or good schools or some of both. This will be true for poor people as well as rich people. Local fiscal advantages are as fully capitalized for low-income houses as they are for high-income houses (Hamilton 1976, 1979).

"Accidents of geography," as the tax-base of localities are often described by the plaintiffs in school finance cases, are increasingly few and far between.

None of the studies that I have reviewed suggest that only the high-income homebuyers respond to fiscal differentials. The poor family that has moved to the low-income communities of Vernon, Vermont, or to Seabrook, New Hampshire, had to pay more for a comparable house there than they would have in the town next door because of the fiscal benefits that the nuclear plant confers on them (less the direct and indirect costs of having a nuclear neighbor). They may live in a property-rich town and pay less in taxes for better schools, but they had to sacrifice something else to make the higher mortgage payments (or rent) on their homes.

Fairness of the System Requires Comparisons of Results

There is a subtle counterargument available to those who like the idea of equalized tax rates (or, what is nearly the same, equalized tax bases) for schools but concede that capitalization undermines the simple equity argument. If capitalization results from local voters' expectations about future costs (taxes) and benefits (schools) that accrue to residence in the community, shouldn't we assume that such rational people can expect that things will change? After all, Professor Fischel, you pointed out (along with the Yinger study's authors) that folks in Massachusetts apparently anticipated that their tax advantages from illegal "welcome stranger" assessments would disappear. Why not assume that homebuyers in "property rich" communities in Vermont or New Hampshire or Ohio, the most recent subjects of judicial attention, also anticipated that their courts would find their advantages illegitimate? Can it have been a great surprise for them to discover this after 25 years of state court activism?

The problem with the counterargument is that it tries to settle a normative argument—what ought to be—with a phenomenon that is essentially amoral. Capitalization is itself value neutral. If new scientific knowledge reveals there is an increased chance that your community will be damaged by an earthquake, home values there will decline. Likewise, if political science revealed that there is a similarly increased chance that your community will be taken over by a political coalition of people who want to undermine public schools, home values will decline. Participants in the housing market—all of the potential buyers of homes—do not care about the source of the risk. But clearly we do in designing a political system. We cannot do much about the earthquake other that prepare to endure it. But we can deal with political hazards that are at least part of our own making.

For this reason—the fact that political institutions are of our own making and hence are moral acts—the ultimate rationale for differences in local government services must rely not on capitalization itself, but whether the political system that produces it is preferable to some other. About earthquakes we have no choice; about our political institutions, we do have a choice (Coons and Sugarman 1978, 1992).

In the following sections, I will deploy the capitalization phenomenon as the centerpiece for an argument that local control over much of educational spending produces better results than a centralized system. Capitalization itself does not justify this system, any more than the knowledge that you are living in a high-crime neighborhood, and thus paid less for housing, justifies burglary. (Robber to victim: "Stop complaining; you knew this was a high crime area and you saved lots of money on rent by living here. If it weren't for the likes of me, you'd have had to pay the money to the landlord.")[29]

Capitalization does refute the simplistic arguments about tax fairness: Different tax rates are not evidence of different economic sacrifice. But it does not by itself address the Jonathan Kozol argument, which asks, amidst all of his special pleading and biased sampling, the fundamental question: Is there any excuse for a system that allows, for whatever reason, the quality of public education of children to vary by location or, for that matter, by any other factor?

How Capitalization Produces Better Schools

The major excuse for the present system is that it performs better than the one towards which the courts have pushed us. There are, of course, plenty of debates about how widely the distribution of benefits of any system ought to be spread.[30] I don't care to explore these philosophical criteria here because I will show that the destruction of local fiscal control that follows from court-ordered centralization probably fails every normative test: It lowers the performance of most students, leaves taxpayers worse off in most instances, and does not seem to help poor children perform better in school or in the labor market. Or, to put it in a positive light, the establishment of a system of local fiscal autonomy (if we had an entirely state-financed system) can raise the average without leaving the poor worse off.

> *The major excuse for the present system is that it performs better than the one towards which the courts have pushed us.*

I want it to be clear to the reader that I am not arguing for reliance on the local property tax to be the sole method of public school finance. Both for redistributive and efficiency reasons, there is a role for the states and the federal government to supplement public education both with funds and with some rules as to how the funds must be spent (Benabou 1996, Fernandez and Rogerson 1996).[31] My contention is that higher-government interventions must be careful not to undermine the virtues of the local system. My beef with the court interventions in school finance, aside from questions about their constitutional legitimacy, is that, despite their many disclaimers about maintaining local control, they have undermined a highly effective aspect of our system of public education. The decisions have moved the public school system in a direction that offers poorer incentives for voters and school officials to provide an efficient level of this important public service.

The theory of the efficacy of local control is simple. (I should emphasize that local control means local *fiscal* control: A political scientist who wrote about his service on a school board flatly declared, "The effective place for citizen control is the budget."[32]) Consider that all local districts must offer a minimum of schooling, so having no schools is not an option. (This is one of those state rules that probably is necessary to control some deviant behavior.) Now consider a school superintendent who offers to the voters (indirectly through the school board, or directly through a referendum) the following proposition: Build 12 new classrooms and hire 12 more teachers in order to reduce class sizes. This will require a 10 percent increase in the local budget, which must be paid from local property taxes.

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[29] Thus capitalization cannot be used as a reason to tolerate crime, but it *is* a reason not to compensate property owners and renters for living in a high-crime neighborhood. As in the school situation, compensation would make them indifferent to the level of crime. On this "moral hazard" aspect of compensation generally, see Louis Kaplow (1986).

[30] A particularly thoughtful application of the egalitarian principles of John Rawls to the school finance issue is Frank Michelman (1969). Michelman concludes that a Rawlsian standard calls for a "minimum protection" approach, which is generally consistent with the categorical aid programs aimed at student characteristics rather than the tax base. Most states used such programs before the 1970s (Hoxby 2001). Michelman specifically rejected the most popular remedy urged in school finance litigation, district power equalization, which is described below in the power-equalization reforms section.

[31] These articles consider mainly the efficiency of the goals of equal educational opportunity, not the means of accomplishing them.

[32] Gerald Pomper (1984, 222). Without such control, he went on, school administrators cannot be prodded to make rational choices between a new math course and an additional secretary for the principal's office.

Will the voters go along with this proposal? They will find it a lot easier to say yes if the proposal raises the value of their homes. This involves a balance of two opposing forces that I have already identified: higher taxes versus better school quality. The higher taxes are both painful to pay by themselves, and they also reduce the value of the home because potential buyers will notice that taxes are higher. On the other side, however, the voter-homeowners know that better schools (or just keeping them from getting worse by overcrowding) that may result from the smaller class sizes will raise their home's value. Hence, in addition to whatever other factors will induce voters to favor or oppose the proposal, its effect on their home values will be a powerful discipline to make the right choice.

Let's suppose that the "cost effective" choice favors the superintendent's proposal. The supposition is that this will attract homebuyers; they will somehow know that the schools are better. How will they know? It is hard to say. It may be that test scores will rise and the school will make the well-circulated booklet called *The Top 100 Schools in California* or similar publications for other states and metropolitan areas. Or the smaller classes may improve education in more subtle ways, and local word-of-mouth will be passed along by co-workers already in the area or by real estate professionals. (Recall the real estate sales people get a larger commission as home prices rise, so they are eager to pass along good news that raises prices.)

What is much easier to say is that home buyers behave as if they know about the quality of local education.

What is much easier to say is that home buyers behave as if they know about the quality of local education. From the capitalization studies described above, we know that homes in communities with good schools attract more buyers and higher bids. The idea has reached even the pages of *USA Today*. "Home Buyers Go Shopping for Schools" (May 15, 1996, B1) reported that "childless house hunters are increasingly asking for houses in quality school districts."

Less obvious is that voters actually behave in a way that rewards the cost-effective proposals and defeats the inefficient ones, whose tax costs outweigh the school benefits. Given the low turnout in most school elections, and given the folk wisdom that all voters care about is lower taxes, how can this elegant theory be reconciled with political reality?

The first thing to point out is that folk wisdom is just wrong in this case; voters obviously are not solely concerned with minimizing taxes. If they were, virtually every school spending issue placed before voters would be defeated. The only ones who would vote for schools would be the direct beneficiaries, those with children in or about to enter the public schools. But in almost every community, these voters are a minority. In the nation as a whole in 1990, only 38 percent of adults lived in households with children under 18. In the absence of capitalization, 62 percent of potential voters have little to lose and much to gain by voting against all school spending. But we do not in fact observe that this happens. The question is, why not?

The answer is that most no-kids-in-school voters are content to stay on the sidelines as long as the higher taxes buy school expenditures whose effects increase (or at least don't decrease) their property values. While the prospect of higher taxes will always bring out some "no" voters, the prospect of preserving or enhancing home values stems the tide as long as the proposed expenditure is realistically designed to make schools more attractive. Of course, some voters will support schools even without any rewards to themselves; they simply want to transfer wealth to future generations. The capitalization principle adds to this incentive, allowing such beneficent voters to do well as well as to do good.

Evidence that Capitalization Grabs Voters' Attention

There is some systematic statistical evidence in support of the previous section's view of the nicely rational voter. Two social psychologists did a survey of voters in a local referendum that proposed to raise property taxes considerably and spend the revenue on local education (Rasinski and Rosenbaum 1987). The referendum passed—I'm pretty sure it was in Evanston, Illinois, though the authors did not specifically reveal it—and the researchers wanted to know why people supported it. One of the

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most frequently voiced reasons, given by people who had no children in the schools as well as those who did, was that a decline in school quality would hurt their home values.

Evanston, the skeptic might point out, is a pretty affluent suburb of Chicago and a university town to boot. Is this behavior typical of other places? Jon Sonstelie and Paul Portney looked at a school referendum in the more middle-class city of South Francisco that was held in 1970. (This was before the *Serrano* decisions and Proposition 13 took away most local control over schools). They concluded that "the larger is the average expected increase in property values in a precinct, the more likely it is that voters in that precinct will support the referendum."[33] They titled their article, "Take the Money and Run" to highlight the fact that even voters with no plans to stay in the community and no children will approve spending measures that will raise the value of their major asset, their homes.

> *...even voters with no plans to stay in the community and no children will approve spending measures that will raise the value of their major asset, their homes.*

What about the lower-income cities? The anxiety expressed by people to whom I've explained this theory is that it may be okay for upper-class places, but lower-income places with declining tax base may be stuck in a "death spiral." The idea is that as taxpaying high-income homeowners and industry depart, taxes must be raised, inducing still more people and industry to depart. Self-help is of no use, according to this pessimistic idea; the Tiebout model works fine for the upper crust, but not for the bottom layer, they say.

Capitalization and simple observation show that this pessimistic theory is not plausible. Cities have long had their ups and downs in tax rates without either crashing or bursting at the seams. Industries come and go, and taxes fall and rise without municipal collapse. This is largely because of an underappreciated aspect of capitalization: It induces homeowners (and other property owners) to stay put and put up a fight against decline. This is because the people who own houses can leave, but their asset—the house and, more particularly, the land—is stuck. If they sell their house at a loss, they take less money with them wherever they go.

I often hear claims that people will have to sell their homes to escape the bite of higher local taxes. To whom will they sell? Some fool who does not notice that the taxes are high? What most people mean when they say this is that they have taken a capital loss and are unhappy about it. They take the loss, however, regardless of whether they sell or stay. Capitalization says that you might as well stay as leave. The "death spiral" depends upon a view that there will be more sellers than buyers, which can only be the case if property prices do not change.

Of course, there are people who do not anticipate their higher tax bills. Having high taxes and a high mortgage may induce such people to liquidate their assets if they don't have enough cashflow to pay both. Thus an unanticipated rise in taxes may indeed induce people to "lose their homes" by selling them, since the bank holding the mortgage usually does not reduce the payments to offset unanticipated tax increases. But even if people do liquidate their assets, there must be buyers who "gain their homes" at a lower price. The higher taxes plus the (now lower) mortgage payments will be just as affordable for the buyer of the home. Housing prices may go down as a result of a loss of tax base or increase in tax rates, but that's no reason for the community to empty out of any particular type of taxpayers.[34]

I mention this because the "death spiral" argument was presented on behalf of Claremont, a New Hampshire town that was the lead plaintiff in the school finance suit in which I testified. Claremont on had a bustling set of mills, but most have closed, and its residents have had to endure higher taxes. But a visit to the town shows that home construction is proceeding, and new schools have been opened. An advertisement in my local paper compared the price of an eight-room home in Claremont with that of nearby Lebanon, which has lower taxes. The advertisement, sponsored in part by the city of Claremont, pointed out that eight-room homes cost on the order of $90,000 in Claremont, compared to about $150,000 in Lebanon. Of course, the tax bill on the Claremont home may be higher than others (a fact the newspaper advertisement did not mention but which potential buyers would certainly discover), but a buyer who saves $60,000 by buying a house in Claremont will have cash left over to pay those taxes. As real estate salespeople say, price cures all.

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[33] Sonstelie and Portney (1980b, 194). See also Benson and O'Halloran (1987), who note in passing the childless voters in Piedmont, California (a suburb of Oakland), support schools because of its benign effect on their property's value.

[34] This implication of capitalization was first pointed out by Bruce Hamilton (1976), who argued that the so-called "flight to the suburbs" could not be caused purely by central city tax increases.

Claremont, moreover, is not a passive observer of the decline of its industrial base. It has an active economic development office, and the issue of revitalizing the town is also raised at school meetings, at which voters are asked to approve or disapprove new school spending. At one such meeting on March 11, 1995, Allen Whipple (a former mayor) spoke in favor of a bond issue that would raise taxes for a new school. He invoked the Sullivan County Citizens for Tax Relief (of which he was not a member), who usually oppose tax increases, in support of the bond issue:

> Their goal is property tax relief. The goal is more than just cutting budgets. The goal is to make city hall and the schools more efficient. An environment must be created that will increase the tax base and the average pay of a worker in Claremont. Part of this will be accomplished by having an efficient education system...The school facilities will play a major role in attracting new business to Claremont.[35]

The budget passed.

...homeownership induces voters to pay attention to the quality of schools as well as property taxes.

State Test Scores May Decline with Centralized Finance

I outlined a theory in the section "How Capitalization Produces Better Schools" that finds virtue in local fiscal control of education. I presented in the "Evidence that Capitalization Grabs Voters' Attention" section some evidence, both econometric and anecdotal, that homeownership induces voters to pay attention to the quality of schools as well as property taxes. This supports the assumptions of the basic theory, but it does not address whether the Tiebout-style system is better than the alternative towards which the courts have been pushing the states. This and the next section address that question.

The basis for one group of econometric tests of the efficacy of public-school competition and local control is the variation among the states in how schools are administered and financed. There are some dramatic differences. A few states have almost totally centralized funding. Hawaii and California are the two most frequently mentioned—and both have highly problematical public schools.[36] Other states have more decentralized funding. New Hampshire leads the pack in this respect, with nearly 90 percent of all education funds coming from local sources—and the state's schools do quite well in sophisticated national comparisons.[37] The large majority of other states range between 35 to 60 percent of all school funds being raised by statewide taxes. Moreover, some states have moved rapidly toward state funding as a result of court orders. These facts have provided the variation needed to decide whether decentralized funding and competition among numerous independent districts provides better schools.

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[35] Mr. Whipple was not squeezing the truth when he pointed out that better schools can help to attract industry. Thomas Luce (1994) found from a study of cities in the Philadelphia area that better schools did attract the labor force that firms need.

[36] California is discussed extensively in the text in section 14. The official statistics about California's funding understate the role of state funds because they count its property taxes as local taxes, when in fact they are almost entirely controlled by the state (O'Sullivan, Sexton, and Sheffrin 1995, 139; Lawrence Picus 1991). John Thompson (1992) reported that Hawaii's public school students performed well below the average for most other states in standardized mathematics tests, and he pointed to that failing as a drawback of its centrally financed school system. David Callies, a law professor in Hawaii, told me orally that Hawaii enjoys the dubious distinction of having three of the four largest private schools in the country.

[37] Comparative data are available from a consulting report for the *Claremont* case by Caroline Hoxby, which is available on the Web at http://www.heartland.org/hoxby.htm. After adjusting solely for participation rates—see the next paragraph in the text to see why—Graham and Husted (1993, 199) found New Hampshire SAT scores were the highest of the 38 states that they ranked. After adjusting for other factors that favor New Hampshire (its higher income, low minority population, etc.), Graham and Husted dropped the state to 8th of the 38 states.

The question is how to decide which states' schools are better. The only consistently graded national test that has been given to a large number of students over the years is the Scholastic Aptitude Test (SAT), which students with college ambitions usually take. SAT scores were once considered unreliable indicators of the quality of education in a state because the test-takers are not a random sample. In some states, only a few seniors who are going out of state to selective colleges take the test (the others take the ACT), while in others (mostly on either coast), more than half of all high-school seniors take the test. States with lower participation rates thus have high SAT scores because the test was taken there only by the better-quality students. But in the last few years economists have used statistical techniques to control for participation rates as well as demographic and economic differences among the states. They find that state SAT score rankings, adjusted for participation rates, are actually reasonable indicators of how much students had learned in the state's schools.[38]

To get a very approximate take on how the SAT rankings related to local funding, I took the 1991 regression-adjusted rankings of 38 states examined by Graham and Husted and matched it with the percentage of school spending financed by the state.[39] In their top ten, none had more than 50 percent state funding. In the bottom ten, all but three states had more than 50 percent state funding. More sophisticated approaches to SAT rankings attempt to control for other factors affecting each state's education system. Of the econometric studies that have undertaken that, none find that especially high levels of state funding (as opposed to reliance on local property taxation) have improved SAT scores among any group, and some indicate that a large state share makes things worse.

David Card and Abigail Payne are the most optimistic of the group. In their preferred specification, they find a small positive effect on SAT scores of students from states that have increased the state's share of funding, but their result is not statistically significant. In their most elaborate specification, however, they found "no evidence that spending equalization across school districts would raise the [SAT] test scores of the lowest parental education group relative to other groups (Card and Payne 1997, 31)."[40] In an earlier study, Mark Berger and Eugenia Toma came to a more pessimistic conclusion. They examined all U.S. states over the period 1972–90, and found that states that supplied a larger fraction of public school spending from nonlocal sources had lower SAT scores, though this also was not statistically significant (Berger and Toma 1994).

Of the econometric studies with statistically significant results, all show a *negative* relationship between statewide SAT scores and the loss of local fiscal control. Thomas Husted and Larry Kenny, who were among the pioneers in using participation-adjusted SAT scores to rank states, examined the trend of school financing over the past 20 years (Husted and Kenny 1995). Their results indicate that states with a larger fraction of education financed by the state had lower SAT scores. States whose supreme courts had previously ordered centralizing reforms had especially low scores.

Sam Peltzman (1993, 353–355) found a modest but statistically significant relationship between 1972–81 increases in the state's share of funding for education and declines in statewide SAT scores.[41] A national study by

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[38] For an excellent pair of studies showing how SAT scores, when adjusted for participation, are reasonable indicators of school quality differences among states, see Dynarski and Gleason (1993) and Graham and Husted (1993). These studies do not specifically look at methods of financing.

[39] Graham and Husted (1993, 201, table 4, column 2). This column shows rankings adjusted for participation rates *and* for demographic characteristics. The finance data were from Augenblick, Van de Water, and Fulton (1993, table 2–B). I excluded federal aid from the base, so that per-pupil spending is state plus local spending.

[40] They examined data on low-income families, not low-property-wealth towns, so the match between the objects of reform and the objects of their study is less than perfect. It should also be noted that using SAT scores to evaluate improvements in low-income places is problematical because so few poor kids take the SAT. This is less of a problem when comparing state averages, since most students from middle-class families do take the SAT.

[41] Peltzman (1996) was similarly pessimistic about the effects of centralization of finance on students who were not headed for college.

Lawrence Southwick and Indermit Gill (1997) which employed data from 1985–91 found a small but statistically significant negative relationship between SAT scores and percent of funding coming from nonlocal sources.[42] (They were mainly concerned with teacher salary structures, however, and found that uniform "comparable worth" structures had a negative effect on the SAT scores of states that had instituted these supposedly egalitarian salary policies, which treated English and mathematics teachers the same as all others.) The sophisticated reports on SAT scores look like a strong vote for local fiscal control.

Competition Among Public School Districts Improves Quality

Aside from requiring a large degree of local fiscal autonomy, the system I have described also requires that there be numerous school districts in which potential homebuyers can live and send their children. If not, cost-effective improvements in the school district cannot raise home values. If the kids all have to go to the same school system, homeowners without children get no special benefit from improved schools, since there will be no enhanced demand for their homes compared to those in any other town. But the higher taxes will be a net cost to them, and they will be reluctant to favor any tax increase. (It is possible for some school-quality capitalization to occur even if there are no alternative public schools, because some potential buyers can opt for parochial and independent schools. There is evidence that a reduction in public school quality does increase private school enrollment.[43] I will not deal with that option except to note that it is not surprising that school vouchers have found most favor in places such as inner-city areas in which residents have few alternative districts in which to live.)

The sophisticated reports on SAT scores look like a strong vote for local fiscal control.

The idea that competition among towns promotes education goes way back in our history. In his fascinating history of Cooperstown, New York, historian Alan Taylor mentions that the town's first free public school was established specifically in response to a rival town that had set one up and was successfully attracting immigrants at the expense of Cooperstown (Taylor 1995, 209). Competition among communities took the form of a "race to the top" even back then.

More recent evidence on competition comes from studies of in-state scores of tests that are administered on a uniform basis and thus do not require the participation-rate adjustment that one must make in comparing states on SAT scores. Blair Zanzig looked at the "Iowa Test" scores of school districts in California in 1970 (before the *Serrano* decision). He found that 12th graders in counties in which there were four or more school districts had higher scores. Counties that had fewer districts had lower scores because, Zanzig inferred, there was less competition among the districts (Zanzig 1997). John Blair and Samuel Staley found that Ohio school districts that were subject to more competition from other public school districts had better reading scores on a standardized, statewide test (Blair and Staley 1995, Staley and Blair 1995).[44]

The foregoing studies all invoked modern econometric evidence and employed extensive control variables in attempt to keep other things equal. They largely point to the possibility that a more decentralized, localized system of financing education produces better test scores. The trouble with them is that we do not know what caused the districts in a given area to be numerous or few in number. Perhaps areas with only a few districts were created that way to take advantage of scale economies. If that were the case, we could not be sure that the worse test results were not offset by some unobservable reasons for consolidation.

In a series of papers beginning with her prize-winning doctoral dissertation, Caroline Hoxby proposed an imaginative test to overcome these problems (Hoxby 2000).[45] She looked for metropolitan areas around the country that had natural features (chiefly bodies of water) that might separate urban areas into school districts. In areas with many such immutable dividers, the fragmentation of school districts would be "natural" in its most literal sense. Using this control, Hoxby found that a greater number of independent school districts in a metropolitan area increased her measure of educational accomplishment (high-school graduation rates and college-going). Her most important finding was that in the competitive situation (i.e., many school districts in the metropolitan area), all schools, even those serving the relatively disadvantaged, got better. Competition among public schools, like competition among private businesses, raises the quality of all.

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[42] The same result—more state funding, lower state scores—was found in a study of using NAEP (National Assessment of Educational Progress) tests by Victor Fuchs and Diane Reklis (1994).

[43] Downes and Schoeman (1998) show that the *Serrano* decision boosted enrollments in California private schools. See also Kenny and Husted (1996). This possibility was actually anticipated by advocates of *Serrano* Coons, Clune, and Sugarman (1969, 419), who did not seem to think it likely to occur.

[44] Borland and Howsen (1993) obtain similar results for a sample of Kentucky school districts.

Hoxby also found that private and religious school competition was beneficial to public schools. The results of her sophisticated econometrics were illustrated in Albany, New York, in an article reported in the *New York Times* (September 30, 1997, 19). A philanthropist was distressed by the poor quality of a public school in Albany. She offered free tuition to students from that school to attend the private school of their choice. Many left. But the public school responded by obtaining additional funds from the city and dramatically improving its program. This stanched the outflow of good students and induced several to return.

Competition among public schools, like competition among private businesses, raises the quality of all.

A less publicized example of the benefits of competition for students is the behavior of rural Vermont and New Hampshire high schools that are dependent in part on the tuition payments from public school students. Many small towns lack a high school, and so, in many cases, their students are given vouchers (usually equal in value to the average cost per high school student in the state) to attend the high school of their choice. The schools to which they can go actively compete for them. Liz Ryan Cole, an instructor at Vermont Law School, has children who attend Thetford Academy, a small public high school near my home in Hanover. She mentioned to me in conversation that her son was taking calculus at Thetford. I wondered how such a small public high school could afford to teach calculus in what she confirmed was a very small class. She replied that the school was making a rational calculation. If it did not offer calculus, its footloose tuition students would go to the larger high school in Hanover, New Hampshire.

Hoxby adds an interesting twist to the incentives provided by capitalization (Hoxby 1996b, 60). My explanation for its superior incentives (compared to a state-funded system) focuses on the benefits that homeowner-voters perceive. But another party is also interested in capitalization. School administrators may realize that efficient school programs, which may be difficult for the public to grasp, will be easier to fund than inefficient programs. The efficient programs improve test scores or other indicia of education quality. This raises the property tax base, and makes it easier for the school administrator to acquire more resources. Even holding the tax rate constant, more funds will flow into the school if the value of the tax base increases.

Hoxby's overall line of research has opened up a new window on school finance issues. She has convincingly demonstrated that where the money comes from and who controls it, not just the amount spent, can make an important difference in the quality of public education. She proposes that one reason that it is so difficult to discern that more money improves education is that much of the vast increase in school spending over the last decades—it is much in excess of the rate of inflation—was accompanied by a shift from local to statewide financing (Hoxby 2001).[46]

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[45] Her thesis is summarized in Hoxby (1995).

[46] The proposition the "money doesn't matter" has been widely and successfully promoted by Eric Hanushek (1986). Hoxby's other reason that money does not appear to matter is the increase in the power of teachers' unions since the 1960s (Hoxby 1996a). Studies using samples prior to that era showed a reasonable connection between spending and homebuyer's perception of school quality (e.g., Oates 1969). I would note that court-ordered education finance reform also started in that era. Hoxby finds an independent effect for both district competition and teacher unionization.

How School Finance Equalization Caused a Taxpayer Revolt

During the 1960s, California had an exemplary public education system. Its university system drew the most favorable notice, but its primary and secondary schools were well regarded, too. They were well-funded, with per pupil expenditures and other indicators of devotion to public education ranking among the top ten in the United States.[47] The funding was a mix of local property tax revenue and state aid.

In 1971, the California Supreme Court ruled for the plaintiffs in *Serrano v. Priest*. It held that the existing system of reliance on local property taxes to finance public schools was unconstitutional if, the court said, children's educational opportunities were dependent on the taxable property-value of the community in which they were located. The court did not in 1971 specify a particular remedy. It left it to the legislature to find an acceptable system. The California legislature responded by increasing the state's existing school-aid program, and it tried to narrow the spending gap by imposing revenue limits on the high-spending districts. After a time however, it did allow local voters to override these limits in special elections, and enough of the elections succeeded that the trend towards expenditure equalization was undermined.

In December of 1976, just as the 1977 legislative session was beginning, the Supreme Court issued another opinion in *Serrano*. *Serrano II* validated, by a 4–3 vote, the simple remedy proposed by a lower-court judge to whom *Serrano I* had been remanded. The legislature had to assure that state plus local spending on general-purpose school expenditures, which excluded special categories such as aid to handicapped students, should vary by no more than $100 per pupil across districts. The $100 range could be exceeded if the reason was not related to property tax-base differences, but in practice few high-spending districts could make that claim. While the California Supreme Court did not prescribe the $100 range as the sole constitutional remedy, the $100 band soon became the litmus for compliance.

The legislature's response to *Serrano II* was a new school finance bill that raised state aid still further and imposed a system by which the additional spending by "property rich" districts had to be shared with other districts. It would have come very close to meeting the *Serrano II* court's $100 range criterion. It was scheduled to be implemented on July 1, 1978. But as the legislature was considering school finance reform in the summer of 1977, an enormous property tax revolt was taking shape. Vigorously promoted by a garrulous former newspaper editor, Howard Jarvis, the voter initiative was placed 13th on the ballot for June of 1978.

In many ways, the prospects for Proposition 13 were not good. The great majority of California voters had shown no interest in property tax reduction initiatives prior to 1977, when the Jarvis-Gann (Proposition 13) initiative began. Two well-run initiatives that would have cut local taxes and handed many local responsibilities, including school funding, up to the state, had been handily defeated in 1968 and 1972. But that was before *Serrano* had any bite. As the legislature struggled to comply with *Serrano* from 1971 onward, property tax payments were increasingly separated from the quality of local schools. The 1977 legislation would have completed the divorce. Voters in 1978 had much less reason to oppose an initiative that effectively kicked almost all school funding to Sacramento.

Moreover, and perhaps fatally, the legislature's "level-up" response to *Serrano II* in 1977 required continued reliance on property taxes and thus foreclosed the possibility of heading off the Jarvis-Gann tax revolt by statewide property tax relief. Although at the time California was running a large budget surplus (driven by inflation and bracket creep), the chief legislative analyst, Alan Post, told legislators that any projected surplus would not be adequate to fund both its school spending bill and meaningful property tax relief (*Los Angeles Times*, August 1, 1977, § 1, p. 3). Legislators knew that taxpayers were upset, but they chose instead to deal with *Serrano* in order to avoid further confrontation with the California Supreme Court. As a result, the Jarvis-Gann initiative became unstoppable.

Proposition 13 was an amendment to the state constitution, and it passed by a 2–1 majority on June 10, 1978. It froze ad-valorum property tax rates on individual properties at one percent, and it rolled back property tax assessments to 1975 levels. Reassessment was permitted only upon sale of the property, except for a maximum two percent annual increase, which was well below property-value inflation. Proposition 13 also banned any statewide property tax, and it required a two-thirds majority of local voters to adopt alternative taxes. The net result was a 57 percent reduction in property tax collections across the state, an amount approximately equal to the property taxes collected for schools. Proposition 13 has continued to keep property taxes in California among the lowest in the nation.[48]

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[47] The best narrative that describes the fall from grace of California's public schools from the 1960s to the late 1990s is Schrag (1998, 38–98). Accounts of the *Serrano* decision and its connection to Proposition 13 are in Fischel (1989; 1996). The best account of the legal relationships between *Serrano* and Proposition 13 is Joseph Henke (1986).

My interest in Jonathan Kozol's *Savage Inequalities* was piqued a few years ago. I had published an article in 1989 called "Did *Serrano* Cause Proposition 13?" I showed that, according to the modern theory of local public finance, it was perfectly rational for California voters in 1978 to embrace a draconian property tax limitation after school finance had been effectively divorced from local tax bases by *Serrano*. Mine was an unusual conclusion among scholars, who had few explanations for the tax revolt other than that voters wanted, as the subtitle of one book put it, "something for nothing in California (Sears and Citrin 1982)."[49]

I was at work on a follow-up article, "How *Serrano* Caused Proposition 13," when I encountered Kozol's book. To my astonishment, I found that Kozol agreed with my hypothesis. He noted that the California legislature responded to the *Serrano* court's second and highly-equalitarian order in 1977 with a plan to substantially equalize spending. He went on to explain:

> As soon as Californians understood the implications of the plan [AB 65, which was the "level-up" legislation]—namely, that funding for most of their public schools would henceforth be approximately equal—a conservative revolt surged throughout the state…Proposition 13, as the tax cap would be known, may be interpreted in several ways. One interpretation was described succinctly by a California legislator: "This is the revenge of wealth against the poor. 'If the schools must actually be equal,' they are saying, 'then we'll undercut them all (Kozol 1991, 220–221)."

Kozol conceded that there might be more to Proposition 13 than that, but he nonetheless concluded that the *Serrano* plaintiffs "won the equity they sought, but it is to some extent a victory of losers." His conclusion was seconded by the dean of education finance, Charles Benson, who had been a staunch supporter of the *Serrano* litigation and its reforms. At a Congressional hearing on school finance reform in the early 1990s, Benson warned, "You must be very careful when you wish for things because you may just get what you wish for. We worked hard for equity in California. We got it. Now we don't like it."[50]

One difference between Kozol and myself is that he continues to argue in favor *Serrano*-style court rulings, and I argue against them. I don't think that Proposition 13 represented "the revenge of wealth against the poor," as Kozol's anonymous informant put it. It passed overwhelmingly in almost every California municipality, rich and poor. Even 70 percent of the voters in Baldwin Park—the epitome of the "property poor" district in the *Serrano* litigation—voted for Proposition 13. But we do agree that fiscal support for education in California has declined dramatically. A sophisticated econometric model by Fabio Silva and Jon Sonstelie attributed half of California's decline in spending relative to other states to the leveling effects of the *Serrano* decisions (Silva and Sonstelie 1995).[51] Support for local schools went south after *Serrano*, and statewide support in Sacramento has been unable to replace it. (It should be noted that there was nothing in Proposition 13 that prevented the state from offsetting the property tax cuts with increased income or sale taxes. Indeed, some well-informed observers regarded Proposition 13 as an opportunity to accelerate compliance with Serrano II [Post 1979, 385; Schrag 1998, 154]).[52]

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[48] O'Sullivan, Sexton, and Sheffrin (1995) provide an excellent analysis of the enduring fiscal effects of Proposition 13.

[49] The popular notion that property tax assessment reform was the culprit is not plausible, since uniform assessment had been the rule in most California counties prior to the reform (Diane Paul 1975, 101), and the vote for Proposition 13 was not especially high in San Francisco, where the scandal that prompted assessment reform arose (Fischel 1996, 626, 120).

[50] Benson was quoted in Hickrod et al. (1995). Hickrod nonetheless urged continuing litigation in the *Serrano* tradition.

[51] For additional facts and some pathetic stories of California's public education debacle, see Schrag (1998, 67–73).

Other Taxpayer Revolts in Response to School Finance Centralization

My account of how *Serrano* caused Proposition 13 has become part of the conventional wisdom among local-public-finance scholars and students of Proposition 13. Even economists who are partial to centralized funding for schools concede that the *Serrano II* court went too far in this direction and pushed the voters over the Proposition 13 cliff (Fernandez and Rogerson 1995). Peter Schrag, a liberal-minded journalist who, as the editorial page editor of the *Sacramento Bee* had a ringside seat to the events surrounding Proposition 13, gives my story considerable credit, if not total acceptance, in his book about the consequences of Proposition 13 (Schrag 1998, 21–22, 148–149). At the very least, according to Schrag, the *Serrano II* decision greatly complicated the California legislature's response to the tax revolt.

However, I believe that other state court decisions have undermined political support for taxes earmarked for schools, and thus indirectly contributed to political reactions that should be considered tax revolts.

Was California unique in its fiscal response to *Serrano*? I have not found another case in which a *Serrano*-style decision—one which requires substantial reductions in local fiscal autonomy—directly led to a statewide property tax revolt. However, I believe that other state court decisions have undermined political support for taxes earmarked for schools, and thus indirectly contributed to political reactions that should be considered tax revolts. I will first review some discrete events in several states (I have not examined all of the states) and then, in the following section, the statistical evidence on the connection between court rulings and the level of support for education.

Maine

Events in Maine are among the closest parallels to *Serrano* and Proposition 13. In 1973, the Maine legislature adopted a uniform statewide property tax designed to "recapture" taxable property in property–rich towns and transfer them to other towns and cities to pay for schools. Because only a few towns (mostly resort towns along the coast) had very high taxable property per resident, the net effect of Maine's statewide tax was to take property tax revenue from a small number of towns and give the proceeds to towns and cities with in which a great majority of the state's population resided. The Maine events are described by Norton Grubb (1974); Kermit Nickerson (1973); and Perrin and Jones (1984).

The 1973 Maine legislation was not the product of popular dissatisfaction with schools or local property taxation. It was explicitly motivated by the school finance litigation that began with *Serrano I* in 1971. A *Serrano*-style suit had made its way to the Maine Supreme Court. At the time (1973), the U.S. Supreme Court was hearing the federal court version of *Serrano*, which was *San Antonio v. Rodriguez*. The Maine court specifically delayed its decision to see how the U.S. Supreme Court would rule.

The Maine legislature, however, decided not to wait. It adopted the statewide property tax plan in anticipation of an adverse ruling. The U.S. Supreme Court ultimately ruled in *San Antonio v. Rodriguez* that states were not compelled to reform school finance, and the Maine court, as a result, backed off. But the Maine legislature decided to keep the law on the books. After all, it looked like a politically attractive thing to do, at least if one simply counted noses. The statewide property tax and the related school funding distribution formula allowed the state to transfer property tax wealth from a few towns to other places in which the vast majority of the permanent population lived. It seemed like a no-brainer.

It was. Despite the apparent fiscal benefits of the 1973 program to most Maine residents, the statewide tax and the related school funding reform were unpopular. After

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[52] It should be noted that neither *Serrano* nor Proposition 13 prevent private contributions to public schools, which are now routine (though small) in most affluent districts. Another alternative to property taxes is the parcel tax, which must be approved, as per Proposition 13, by a 2–3 local vote. A parcel tax is applied to the parcel itself, not its value, and so it is regressive: mansions pay the same as mobile homes. Parcel taxes are a minor supplement for local schools, usually in affluent areas. On both of these alternatives, see Brunner and Sonstelie (1997).

4 years of tinkering with the distribution formula, legislators agreed to hold a referendum on the tax in 1977. The vote to repeal it passed with an overwhelming majority. Although the small "property-rich" towns that bore the brunt of the statewide tax did vote disproportionately for repeal (in one town of about 400 voters, only a single voter favored retaining the statewide tax), a majority of voters in municipalities that supposedly benefited from the state tax also voted to repeal it. An article that examined the votes by towns and the events leading up to it concluded that "the amorphous issue of loss of local control was successfully raised by those groups seeking rejection of the Uniform [statewide] Property Tax (Perrin and Jones 1984, 496)."

New Jersey

The New Jersey Supreme Court came in second to California's in its holding that the state's reliance on local funding was unconstitutional, but it holds the record for the lengthiness of the litigation. Its first ruling was in *Robinson v. Cahill* in 1973, a year after *Serrano*, and its final ruling (at least the court said it was the last) came in the successor case to *Robinson*, *Abbott v. Burke*, in 1998. New Jersey's holding was based on a provision of its state constitution that called for a "thorough and efficient" system of education, and the court concluded that those words required much more state funding. In 1976, the court actually closed the schools because the state legislature would not pass a bill, sponsored by the governor, that replaced much of the local property tax with a new state income tax.[53] The legislature promptly rolled over, and New Jersey adopted an income tax for the first time in its history.

...it was not merely the prospect of higher state taxes that upset New Jersey voters....The new formula would have caused enormous shifts in home values...

The new income tax did not, however, work to the court's satisfaction, and in 1989, it held in *Abbott v. Burke* that the lowest spending districts had to be brought up to the level of the highest. Newly elected Governor Jim Florio induced the legislature, both houses of which had solid majorities of fellow Democrats, to comply with the court's order. They passed a steep increase in income taxes, offering little reduction in property taxes to the higher spending districts. According to Rutgers political scientists Russell Harrison and Alan Tarr, the 1990 bill "proved extremely unpopular, contributing to the election of veto-proof Republican majorities in both houses of the state legislature in 1991 and to Florio's defeat when he ran for reelection in 1993. Responding to citizen outrage, the legislature in 1991 amended the Quality Education Act [Florio's *Abbott* response] to divert $360 million from school aid to property tax relief. (Harrison and Tarr 1996, 183)."[54] This turnaround is to my mind almost as dramatic as the passage of Proposition 13 in California in 1978.

It is important to understand that it was not merely the prospect of higher state taxes that upset New Jersey voters. Governor Florio's plan also involved a redistribution of school aid among districts (most of which correspond with the boundaries of New Jersey's 543 municipalities). The new formula would have caused enormous shifts in home values, according to a simulation study by William T. Bogart, David Bradford, and Michael Williams (1992). Although on balance this would have shifted wealth from high-income to low-income communities, their study found much perverse shifting, including the fact that the poorest community in the state, West Wildwood, would have been a net loser from the system. (I assume West Wildwood lost because its seaside vacation property made it look "property rich" even though its year-round residents were "income poor"—that is, just plain poor.) In the long run, Bogart, Bradford, and Williams concluded, the state would have had a net loss in property values as higher-earning households avoided the state for more favorable fiscal climes in Pennsylvania or New York.

Massachusetts

Two well-known property tax revolts, those of Massachusetts and Michigan, are not directly associated with school finance litigation. I nonetheless want to suggest that the penumbra of these cases may have had an effect on political decisions to reduce reliance on property taxation and throw its schools into fiscal disarray. Proposition 2.5 in Massachusetts was passed in 1980, and it remains the best-known offspring of Proposition 13. It was less extreme than California's initiative but it nonetheless did hold down property taxation and, according to Dutch Leonard, greatly retarded the growth in school spending across the state (Leonard 1992, 21, 86).[55] I suspect that Proposition 2.5 can also trace some of its lineage to *Serrano.*

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[53] Lewis Kaden (1983) reviews the New Jersey Court's battles with the legislature through the 1970s.

[54] For other studies with similar conclusions, see Bogart and VanDoren (1993), and Michael Mintrom (1993).

The initial evidence for this idea occurred to me when I read Massachusetts's 1993 decision, *McDuffy v. Secretary. McDuffy* is the Massachusetts version of *Serrano*, but, of course, it was decided more than two decades later. However, the *McDuffy* court noted that the suit was actually begun much earlier (615 N.E.2d 516 at 518):

> Initially, suit was commenced in May, 1978, under the caption *Webby v. Dukakis*, by the filing of a complaint and a motion for class certification in the Supreme Judicial Court for the county of Suffolk. Shortly thereafter, the Legislature enacted "School Funds and State Aid for Public Schools," St. 1978, c. 367 § 70C (codified at G. L. c. 70). Following that legislative enactment, the case was inactive for five years, until 1983, when the parties initiated discovery.

The changes in school finance in Massachusetts in 1978 all move in the same direction as the **Serrano***-induced legislation moved California's school finance system.*

According to a *Boston Globe* editorial (May 16, 1978, 16), the 1978 suit had been brought shortly after the state House of Representatives had refused to pass the new school finance bill, Chapter 70. (That is the "G. L. c. 70" referred to in the *McDuffy* quote.) The Representatives soon changed their vote and passed the legislation, and the suit was dropped. As political scientist Edward Morgan reported, Chapter 70 was highly redistributive (Morgan 1985, table 1).[56] From 1978 to 1980 (the period during which Chapter 70 operated without Proposition 2.5), all measures of inequality in per pupil spending declined. Chapter 70 was also centralizing, increasing state funds from 35 to 50 percent of total expenditures. The changes in school finance in Massachusetts in 1978 all move in the same direction as the *Serrano*-induced legislation moved California's school finance system.

Unlike my evidence in California, however, I do not have any "smoking gun" statements by Massachusetts legislators that they were responding to a court order or that they were unable to head off property tax revolts because of their school-spending reforms. However, the further history of the *McDuffy* case (reported in the 1993 opinion) does suggest as much. By 1983, the school finance litigation was active again, and again the state legislature responded in a way that apparently induced the plaintiffs to back off again.[57] This suggests to me that the legislature had been responding in all phases to the threat of litigation.

An explicit court order might not have been necessary to goad the legislature in 1978. The *Serrano* precedent greatly increased the chances (we know from the subsequent 1993 decision) that the Massachusetts court would force the legislature to undertake a centralizing school finance reform. *Serrano* had been a leading precedent in other states whose courts had struck down existing systems of school finance. These included such Massachusetts-like states (eastern and urban) as Connecticut in 1977 (*Horton v. Meskill*) and New Jersey in 1973 (*Robinson v. Cahill*). There were strong reasons for the Massachusetts legislature to preemptively surrender to the *Webby* plaintiffs, and the behavior of the plaintiffs, who dropped the suit as soon as Chapter 70 passed, indicates that they took the legislature's concession as equivalent to winning in court.

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[55] See also Ladd and Wilson (1985).

[56] Further evidence that Chapter 70 reduced local fiscal control is provided by a study by Carroll and Yinger (1994), who found that property taxes were not shifted forward to renters in Massachusetts in 1980, contrary to the implication of the Tiebout hypothesis. Carroll and Yinger take this as evidence against the applicability of the Tiebout model. I take it as evidence that Chapter 70 had undermined the Tiebout model, and, as in California, this inclined more voters to embrace the property tax revolt.

[57] As reported by Reschovsky and Schwartz (1992), the 1985 Massachusetts legislation again reduced the fiscal disparities among school districts.

Because Proposition 2.5 was a milder constraint on local government, however, Massachusetts towns were gradually able to escape its constraints during the property-boom of the late 1980s, and locally driven school spending became more unequal. This inequality is what finally brought the court to make its decision in *McDuffy* in 1993. This scenario did not play out in California because both *Serrano* and Proposition 13 were more stringent than the *Webby*-induced (I suspect) Chapter 70 and Proposition 2.5. After *Serrano* and Proposition 13, California school districts had virtually no discretion to use property taxes to raise spending.

Michigan

The Michigan experience is still more of a stretch for my theory. In 1993, the Michigan legislature practically abolished the use of local property taxes to finance schools.[58] It offered voters a choice of an income or a sales tax to fund schools, and the voters chose the sales tax in a 1994 referendum. This looks like the quintessential tax revolt, aimed at school finance, but without any explicit goad from the courts. Indeed, when I have asked Michigan-based scholars whether a court ruling played a part in the state's decisions, the invariable response is "we did it to ourselves."

[in Michigan] The court majority ruled that local property taxes were unconstitutional as a basis for school finance.

Yet there is a penumbra effect that seems detectable in the Michigan history. There was a *Serrano*-style ruling by the Michigan Supreme Court in 1972. In *Milliken v. Green* (also known as *Governor v. State Treasurer*), Michigan's Governor Milliken sought an advisory opinion about the constitutionality of Michigan's school finance system, which was then the usual hybrid of local property taxes supplemented by state funds, with much variation in local tax rates. The court majority ruled that local property taxes were unconstitutional as a basis for school finance. The court's advisory opinion was not binding on the legislature. That it was intended to signal the legislature about how the court would rule in if a true controversy was brought in future was indicated by Judge T.E. Brennen's tart dissent in the case (at ¶208): "The majority opinion is not good law. It is not even law at all. It is a political position paper, written and timed to encourage action by the state Legislature through the threat of future court intervention." Judge Brennen went on to detail the events that led up to the decision. By the next year, the case was vacated because the U.S. Supreme Court had undermined the state's equal protection argument with its *San Antonio v. Rodriguez* decision, and newly appointed Michigan supreme court judges were not so eager to have the state court lead the way to school finance reform. And perhaps because the Michigan legislature preemptively surrendered, so no suit was brought to the court.

Other sources indicate that in 1973, the Michigan legislature responded to the court's wishes with a "Robin Hood" style school finance bill, one that took from the property-wealthy and gave to the property-poor (Hirth 1994 and Rothstein 1992). The system that was finally rejected in 1993 was a "power equalization" formula of the type described in the next section. (As I shall explain in "The Power-Equalization Reforms" section, power equalization makes homeowners less concerned whether the taxes come from a local or statewide source, thus undermining one of the primary attributes of a local property tax system.) While Michigan's system was subject to much legislative tinkering, it remained in place until the legislature voted to abolish school property taxes in 1993. It is surely too strong to say that the dead hand of the 1972 Michigan Supreme Court reached forward to tap the shoulders of Michigan legislators in 1993, but many observers regard the success of school finance litigation in general as having a powerful background influence on state legislative decisions.[59]

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[58] The events are described and analyzed by Courant, Gramlich, and Loeb (1995), who note that the Michigan reforms seem poised to reduce average spending.

[59] Norton Grubb (1974, 483) confirms that the Michigan legislature acted in response to Milliken. Augenblick, Myers, and Anderson (1997, 63) conclude that "even where litigation has not occurred or has not succeeded, the prospect of litigation has prompted revisions of state funding policies." Susan Fuhrman (1979) noted that the *Serrano* decision precipitated legislative actions in Maine (as I have discussed in the text above) and in Oregon, specifically to forestall court actions. See generally Michael Heise (1998).

Vox Populi: The Michigan 1994 referendum is often described as a popular rejection of the property tax. Yet what was presented to the voters there was a choice between different statewide tax packages, not a locally controlled property tax. As a whole, severe constraints on the use of the local property tax in the post-World War II period did not arrive until the school finance movement had succeeded in largely divorcing local revenues from local school expenditures.

Before the *Serrano* case had succeeded and school finance reformers flocked to the courts, the issue of whether schools financing should be shifted from the local property tax to a statewide tax was actually put on the ballot in several states. Voters rejected these proposals in Colorado in 1972, Oregon in 1973, and California in 1972.[60] Constitutional amendments to centralize school financing were also rejected by voters in Michigan in 1971 (Hain 1974, 351) and in Illinois (Dye and Giertz 1994).

> *...the issue of whether schools financing should be shifted from the local property tax to a statewide tax was actually put on the ballot in several states.*

In New Hampshire, the court's 1997 decision against local control was preceded by a 1992 gubernatorial race in which the centerpiece was the issue of local school finance. A well-funded, articulate challenger proposed to replace local property taxes with a state income tax. As Colin Campbell and I showed (Campbell and Fischel 1996), her defeat can best be interpreted as a rejection of her platform.[61] In other states, the court decision favoring *Serrano*-style centralization was followed by a referendum. West Virginia voters were asked to approve a revenue-equalization bill that responded to its court's *Serrano*-style decision (*Pauley v. Kelly*), and the voters said no: "The people wanted local control of taxes (Flanigan 1989, 234)." On May 5, 1998, Ohio voters rejected by a four-to-one margin a proposal to replace local property taxes, whose variations were found unconstitutional by the Ohio Supreme Court in *Derolph v. State* in 1997, with a two percentage point increase in the state sales taxes.

Have Court Decisions Raised or Lowered School Spending?

My 1989 paper that connected *Serrano* with Proposition 13 was among the first to argue at length that court-ordered school finance reform might backfire and actually reduce the resources available for public education. Before reviewing other studies, I should note that some advocates of school finance reform are not entirely upset by this finding. Their primary goal is equality. While an equality that raises average spending per pupil statewide is preferable to one than lowers average spending, these equalitarian types would rather see an equality of low-spenders than a high-spending system that, in their eyes, leaves some students behind.

The feeling was best captured in a *New York Times Magazine* article about Vermont, whose response to its court's *Serrano*-style decision effectively lowers spending by some of the "property rich" towns like Stowe (also discussed in "The Power-Equalization Reforms" section). Allen Gilbert, a former school board member in the neighboring town of Worcester and the vice president of the Vermont School Boards Association, is quoted as saying, "For years, Stowe kids have had advantages that kids in Worcester haven't had. You have to take some of those advantages away to level the playing field (Burkett 1998, 42)."[62]

The sentiment that Mr. Gilbert seemed to express is that kids in his hometown of Worcester will gain relative to those of neighboring Stowe as a result of fiscal equalization that pulls Stowe down. This is doubtful. The clearest experience is that of California, which did "level the playing field" in a downward direction. Thomas Downes did a detailed study of the distribution of sixth-grade standardized test scores among school districts before and after both *Serrano* and Proposition 13. He found that the difference between the high-scoring and low-scoring districts remained almost exactly the same in 1985–86, 7 years after the *Serrano*/Proposition 13 level-down, as they were in 1976–77, prior to Proposition 13 and the implementation of the *Serrano II* decision of December, 1976 (Downes 1992). Courts can level the spending, but that does not necessarily level measurable indicators of education accomplishment.

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[60] Citations to these studies are in Campbell and Fischel (1996, 12). Others are mentioned in Paul Carrington (1973). Histories of school finance also point out that state legislatures have debated the issue of local versus state funding almost from the beginning of the republic (Ellwood Cubberly 1919; Morton Keller 1994, chap. 2). Kirk Stark (1992, 809–812) describes a mid-1800s Indiana case that sounded exactly like *Serrano*, except that the legislature largely ignored it, and the court subsequently changed its mind.

[61] One of the losing candidate's principal advisors was the lead attorney in *Claremont v. Governor*, which in 1997 overturned the state's school finance system, in effect requiring the adoption of the platform that the voters had rejected.

[62] Other statements in the same article by Mr. Gilbert indicate that he was not being quoted out of context.

But Mr. Gilbert's "level-down" sentiment is not typical. Most advocates of school finance reform desired and expected that the litigation they were sponsoring would "level-up" the playing field, so that spending in all but perhaps the richest districts would increase. Meeting shortly after the first *Serrano* decision, the lead attorney for the plaintiffs concluded that "it appears almost inevitable that statewide education expenditures will rise" (Lawyers' Committee 1971, 161). The balance of this section will concentrate on the evidence about court decisions' effects on spending levels. I am not concerned here with the decisions' effects on the lowest spending districts or with the effects of reform on educational quality (most of which is negative, as reviewed in the "State Test Scores May Decline with Centralized Finance" section). Even if test scores don't change (or may get worse), don't the reforms at least raise spending, since the state, with its access to sales and income taxes, has deeper pockets than the local governments? Nearly every advocate of school finance litigation at least implies that state-plus-local spending per pupil should rise with a court victory.

Most advocates of school finance reform desired and expected that the litigation they were sponsoring would "level-up" the playing field, so that spending in all but perhaps the richest districts would increase.

In California, however, the results were quite to the contrary. As many observers have detailed, spending per pupil in California has slipped from it pre-*Serrano* position near the top of the 50 states to a persistent position in the lower quartile. In comparison with resources available, California ranks at the bottom among the states, and even a 1988 initiative that required that 40 percent of the state's budget be devoted to education has been unable to budge it (Schrag 1998, 164–67). The state's post-*Serrano* experience is best summarized by the title of a 1991 article by Neil Theobald and Lawrence Picus (1991), "Living with Equal Amounts of Less: Experience of States with Primarily State-Funded School Systems."[63] (Washington State, whose court had overturned local financing in *Seattle School District* in 1978, was their other major example, and it currently ranks third, after California and Utah, in average class size.) Even if California were unique in its response, it must be kept in mind that California is by far the largest state and so has the most public school students. One-seventh of the nation's children attend public schools that would be far better than they are but for the *Serrano* decision.

Although California's is probably the most extreme response to court-ordered equalization, scholars who have looked at the experience of other states have concluded that it was not the only example. Bradley Joondeph, a law professor, examined in detail the subsequent experience of five of the six states whose supreme courts had ruled for plaintiffs in school finance suits prior to 1984 (Joondeph 1995).[64] (New Jersey was excluded because of lack of comparable data.) Joondeph looked at the growth in per pupil spending in the five states from the year of their decision to the 1991–92 school year and compared it to the United States average growth over the same period. California was the slowest, growing at only half the United States rate from 1977–78 to 1991–92. Indeed, Joondeph concludes that even the lowest-wealth districts in California fared worse than they would have without the litigation, assuming California's spending growth would have been similar to the nation as a whole without the decision.

But other states with court-ordered equalization fared poorly, too. Per pupil expenditures in Wyoming and

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[63] Along with Silva and Sonstelie (1995), Terry Schwandron (1984, 132–136) found that the decline in California's per pupil spending relative to other states began shortly after the first *Serrano* decision rather than just after Proposition 13 was passed.

[64] He used a 1984 cut-off for cases to allow enough time for legislation to respond to the court decisions.

Washington also grew at only about two-thirds the United States average after their courts' decisions, and Arkansas grew at slightly less than the United States average. Of the five states Joondeph examined, only Connecticut grew faster, with per pupil expenditures growing at more than two and a half times the national rate. A post mortem on Connecticut's experience by Wesley Horton, the attorney who both conceived of the case and provided his son as the lead plaintiff, indicated that the major accomplishment of his litigation was that teacher salaries are now among the highest in the nation (Horton 1992, 718). (Anyone who suspects that these cases are the result of indigenous dissatisfaction with public schools should read Horton's article, in which he makes clear that the Connecticut case was entirely the product of legal scholars and activist lawyers.[65])

Michael Heise examined the experiences of New Jersey and Wyoming, whose courts had overturned local financing (Heise 1995).[66] He found that, when other factors that influence per pupil spending are controlled for by regression analysis, the court decisions had little or no effect on spending trends. His estimated coefficient for the court decision indicated that New Jersey's spending growth actually slowed after the first court decision, though I would note that the New Jersey litigation has gone on so long that it is hard to identify a particular ruling as being controlling.

At the state level, the school budget is often a battle of interest groups.

Statistical Evidence on Court Decisions and Spending Levels

Another type of study of the effects of court-ordered reforms on spending levels forgoes the nuances of individual state experiences and instead uses legislative and judicial reform as discrete events to be analyzed by statistical methods. In this approach, the reform either happened or it did not. It allows for a national comparison of states that have adopted school finance reforms with those that have not.

The approach was pioneered by Thomas Downes with an undergraduate coauthor, Mona Shah (Downes and Shah 1995).[67] Downes and Shah identified state supreme court decisions that favored plaintiffs and the dates at which they were handed down. Using sophisticated econometric techniques, they attempted to see what effects the court cases had on subsequent spending. (The basic idea was similar to that of Joondeph, described earlier, but with a larger sample of states and an attempt at explaining what other factors may have affected spending.) Downes's findings confirm that there is no reason to expect that a court order favoring the plaintiffs will actually raise state spending relative to the national average. Moreover, he found that states that had centralizing reforms imposed by the state's supreme court were more likely to fall behind in spending relative to the nation than those whose reforms were purely legislative.

The most important contribution of Downes and Shah's study, however, was their inference that court-ordered reform appeared to alter the structure of school finance decision-making in the states. Thus the alteration that I argued occurred in California (and for which Silva and Sonstelie provided confirming evidence) seemed to have occurred in other states as well. When school funding is dramatically shifted to the statewide level, I argue, the average voter at the local level is no longer the primary determinant of spending. At the state level, the school budget is often a battle of interest groups. Pro-spending interests like teachers' unions have to compete with the highway lobby, environmentalists, medical services, and welfare supporters.[68] The parents of children in school and the owners of homes that such parents might buy are almost completely absent at the state level.

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[65] Other evidence that cases are ideologically, rather than practically, motivated is in Lawyers' Committee (1971) and Lee and Weisbrod (1978).

[66] Harrison and Tarr (1996) concluded that New Jersey's considerable rise in spending per pupil after litigation began merely continued previous trends and could not be attributed to court decisions.

[67] See also Downes and Figlio (1997) and Downes (1997).

[68] Dennis Leyden (1992) shows that interest group competition at the state level could raise or lower spending on schools. See also Picus (1991). From my current perch in Seattle, I have found that the fortunes of Washington's schools are largely dependent on the state's sales tax revenue, and that source has many claimants. The strategy of the Seattle School District plaintiffs envisioned the state adopting new statewide revenue sources to fund it, but the voters have so far declined to go along (Betty Jane Narver 1990, 162; Margaret Plecki 1997).

While Downes and Shah's evidence does not point to any particular political model to account for the shift they observed, their evidence is consistent with the proposition that where the money comes from does make a difference in how much will be raised. Simulations of particular types of equalizing reforms also show a considerable shift in how budgets are determined. Therese McCarty and Harvey Brazer found, for example, that reforms of the type often required by the courts are as likely to reduce average spending levels as they are to raise them (McCarty and Brazer 1990).[69] Perhaps the most disturbing simulation study is by Shawna Grosskopf and others, who used data from Texas school districts and forecast the effects of its court-ordered school finance equalization (*Edgewood v. Kirby*). They found that "budgetary reforms designed to equalize expenditures could actually increase the inequality of student achievement (Grosskopf et. al 1997, 116)."[70]

> *Downes and Shah's ...evidence is consistent with the proposition that where the money comes from does make a difference in how much will be raised.*

Not all of the econometric studies of school finance reform efforts are pessimistic about spending levels. Robert Manwaring and Steven Sheffrin undertook an analysis somewhat similar to that of Downes and Shah. They found that "litigation ultimately had a negative effect [on spending per pupil] in eight states and a positive effect in fourteen others" (Manwaring and Sheffrin 1997, 117). Like Downes and Shah, Manwaring and Sheffrin also found evidence that especially stringent reforms ordered by courts had a depressing effect on spending. An especially large increase in the state share of spending appears to undermine the relationship between income and willingness of voters to tax themselves for education. The capitalization hypothesis described in the "How Captialization Produces Better Schools" section explains this seemingly perverse effect: When higher spending does little for home values in a community, education becomes just another claim on tax dollars, and higher income people no longer are willing to tax themselves as readily.

The most optimistic view of the effect of litigation on education spending is offered by William Evans, Sheila Murray, and Robert Schwab (Evans, Murray, and Schwab 1997a).[71] They find that court-ordered reforms accelerated school spending for the poor districts within a state without having an adverse effect on the rich districts. (They count as "rich" districts that spend a lot, without regard to income or taxable wealth.) This is not necessarily contrary to the Downes and Shah or to Manwaring and Sheffrin, since Evans et al. do not control for the national growth in overall support for education or for other determinants of spending. Even with this caveat, however, Evans et al. base their assessment on dubious classifications of states. For example, they include in "court reform" states Wisconsin, whose 1976 decision in *Buse v. State* actually overturned a legislative plan to tax high-wealth districts for the benefit of others (contrary to what had been mandated by *Serrano II*), and they eliminated Vermont because they claimed, erroneously, that Vermont has no unified school districts. They also erroneously claim that New Hampshire had a major legislative reform of school spending in 1974. My home state has not wavered from local funding for the past 30 years.

The possible misclassification of states is a problem that all studies mentioned in this section share in some degree, so it is not entirely fair to single out Evans, Murray and Schwab. The interaction between the courts and the state legislatures is often subtle, and deciding that one state has had a court order at a particular time while other states have not is not easily done. As a further example of judicial advance-signaling (beyond those mentioned above in section 15), the Wyoming courts came down with a strong equalization order in its 1980 *Washakie* decision, but the court clearly telegraphed its intentions way back in 1971 (Heise 1998, 24). More generally, the acceleration in the success of school finance plaintiffs surely means that few state legislatures can be entirely surprised when they are hit by one. This in turn means that dating "before" and "after" reform is becoming ever trickier. As time goes on, it is harder to know what state legislatures would have done in the absence of litigation.

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[69] For similar findings, see Paul Rothstein (1992).

[70] On the saga of Texas, whose supreme court's *Edgewood* decisions have vacillated between overturning local financing and then overturning the state's response because it undermined local control of taxes, see Mark Yudof (1991a).

[71] Christopher Bell (1988) also finds a modest increase in spending in states with a larger share of funding coming from state sources, but he also finds that states with more competition among school districts increases spending.

The Power-Equalization Reforms

Caroline Hoxby (Hoxby 2001) has come up with a way to evaluate the effects of school finance litigation and the subsequent response of the state legislatures that does not depend on identifying particular decisions. She instead examined the structure of the school finance system in each state. I have so far pretty much assumed that all centralization of taxation and equalization of school spending has followed the same course: less reliance on local funds means that property tax capitalization is less important. But Hoxby makes the arresting point that school finance centralization should be regarded as a tax on school districts, and not all taxes are structured the same.

This will sound odd to many readers, since most state programs have as their goal to increase spending, at least for those districts that are considered low spenders or are "property poor." But a state-financed subsidy system to local districts is also in many ways a tax system. Consider the analogy of welfare payments for poor families. Welfare is intended to increase the spendable income of poor people. But because welfare is intended only for the poor, the system is also a tax on the income of the poor from other sources. If the head of a poor family gets a good-paying job and the welfare agency learns about it, the family's welfare payments will decline. Thus welfare rules of this type amount to a tax on earned (nonwelfare) income. If the welfare payments (including payments in kind such as food stamps, medical care, and housing subsidies) are reduced by a dollar for every dollar earned, then the effective tax rate that the welfare system imposes is 100 percent. We should hardly be surprised if people on welfare find it hard to get off of it at that tax rate.

But Hoxby makes the arresting point that school finance centralization should be regarded as a tax on school districts, and not all taxes are structured the same.

Centralized school finance systems usually operate very much like the welfare system. Their goal is to supplement the spending of districts designated as poorer than others. Since most states do not have enough funds to supplement all districts by the same amount (unless the state simply runs the schools), they must have some criteria by which state funds are reduced as districts become richer. This reduction is a kind of tax on local spending. Hoxby demonstrated that states which raised this "tax rate" on local districts did indeed fall behind in per pupil spending compared to the national average (Hoxby 2001, 1998a).[72]

I do not propose to review here each of the formulas by which states can fund schools.[73] The one I do want to review is the system that has been urged most frequently as a result of successful school finance litigation. It was first mentioned as a solution to school-spending inequities in the *Serrano* decision in 1971. The most complete description of the plan was given by three law professors, Jack Coons, William Clune, and Stephen Sugarman. Their 1970 book, *Private Wealth and Public Education*, became the Bible of the school finance reform movement (Coons, Clune, and Sugarman 1970).[74] Its solution to the apparent inequalities among school districts was elegant and, at least in the telling, seemingly moderate.

Localism should not be entirely overcome. Its objectionable inequality, according to Coons, Clune and Sugarman, was not one of spending or tax *rates*, which could reflect personal preferences of voters. Its inequality was in tax base per student. Some towns were "property rich" and could tax themselves at a low rate and get gobs of revenue, while other towns were "property poor" and had to tax themselves at a high rate to get even a middling amount of revenue for schools. (The idea that such differences might be capitalized in home values was never considered.) The way to escape this and still retain local control ("subsidiarity," in their word) was to jettison the usual formulas for state aid and replace it with one they called District Power Equalization.

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[72] She also showed that in those few states in which reforms reduced the state's tax on local spending, overall spending grew rapidly. This accounts for New Jersey's rise in spending for at least part of the time it was wrestling with (and not complying with) its school finance decisions.

[73] See Hoxby (2001) for a reasonably accessible description of several types of systems and their effects.

[74] District power equalization did not originate with this book however. As Hobby and Walker (1991) point out, Texas had adopted—and later rejected—a version of it in the 1920s. Plus ca chose...

Power equalization worked like this. The state government would put in place a formula that would ensure that for any given local tax rate, every district in the state could generate the same level of expenditures per pupil. Thus if San Francisco could raise $1,000 per pupil at a tax rate of .01 on the full market value of its taxable property, Los Angeles should also be able to tax itself at .01 and generate $1,000 per pupil in local revenues. The districts did not have to actually tax themselves at the same rate, but if they did, the formerly "property poor" districts would get the same spending per pupil as the formerly "property rich." Thus, if Richmond, California, a city that has oil refineries and was thus "property rich" could raise more than $1,000 at a tax rate of .01, the excess money generated at that tax rate (or whatever rate it did choose) would be shipped off to the state to assist other districts so that they could raise the same amount of money for the same tax rate. (Richmond is in fact a low-income city with a large African-American community whose formerly well-funded school system went bankrupt in 1991.) The idea was to treat every district as if its tax base were that of the entire state, but not to insist that every district spend the same amount per pupil.

The idea was to treat every district as if its tax base were that of the entire state, but not to insist that every district spend the same amount per pupil.

The unpretty side of this business were its consequences for the "property rich" districts. They not only had to support their schools on their own resources, but they had to send money to other districts. This transfer was called "recapture" by the power equalization advocates, who seemed to assume that the "property rich" district had stolen something from the others. And it neglects entirely that people who bought homes in those districts paid much more for them and thus committed themselves to a larger mortgage.

I have recently watched as the state of Vermont, on the other side of the Connecticut River from my home in Hanover, has enacted a version of power equalization in response to its version of *Serrano*.[75] The largest town that is considered "property rich" is Stowe. It is the home of several ski areas, including the Trapp Family Lodge, still owned by the real-life descendants of the legendary heroes of *The Sound of Music*. The ski areas and attendant commercial and vacation-home development have pulled Stowe from a formerly remote, mountainous backwater into the ranks of what Vermont's school finance reformers call a "gold town." These towns are expected by Vermont's version of power equalization to continue to decant their golden eggs at an increased rate and share them with the rest of the state.

As the Vermont power-equalization system is proposed to work, voters in Stowe must tax themselves $1.40 to get $1.00 in local school spending, and this ratio is expected to rise to more than $1.90 in a few years. This would amount to a ninety percent surtax on Stowe's school spending, with the proceeds of the surtax earmarked for spending in less property-rich towns. (This is in addition to a statewide property tax, but that tax does not by itself raise local price of education.) Stowe school officials anticipate that this will decimate their highly regarded school system as local voters rebel at paying the higher taxes. Indeed, three other Stowe-like towns are in open revolt at this writing (July 1998). Two are refusing to send local property tax revenues to the state, and one is mapping a plan to abolish its small public school and open up a substitute private school.[76]

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[75] The case is *Brigham v. State* (1997). For a description, see Teachout (1997).

[76] For current though somewhat partisan sources on the unfolding drama of Vermont's Act 60, see the excellent Web Site kept by Jeff Pascoe of South Burlington, Vermont: http://www.act60.org/.

My encounters with community leaders in Stowe (I spoke at a Rotary Club meeting in February 1998) suggested that the local reaction to Vermont's power equalization program was more bewilderment than anger. The town had carefully nurtured its development, doing its best to keep it from overrunning its bounds. Enormous amounts of volunteer energy had gone into various town boards over the years. The town's commercial development has generated sales and business-profits tax revenues that were already given to the rest of the state. What crime had Stowe committed that required the state to "recapture" the remaining taxable wealth?

Why Power Equalization Discourages Local Support for Education

The appeal of Coons's power equalization plan goes back, I believe, to the ideal expressed by Jonathan Kozol. To true equalitarians, spending on education should not depend on one's parent's wealth or the wealth of the district itself. The idea of a "level playing field" was linked with the idea of a single, statewide tax base. As Jack Coons put it in a defense of power equalization, having every community face the same tax rate for the same expenditure was no more or less controversial than having every person face the same prices in the grocery store. In other words, Coons, like other advocates of power equalization, equated tax rates with prices.[77]

What crime had Stowe committed that required the state to "recapture" the remaining taxable wealth?

Alas, it is not true. Most economists and political scientists regard local decisions as being made by a majority of voters, even if they are nominally made by elected representatives. This majority can be represented by a construct called "the median voter." She is the one who stands in the middle of the electorate on any issue, and, in most cases, her vote will be in line with the winners.[78] Now suppose an election is held in which it is proposed that property taxes be raised to fund a better local education. The median voter asks herself, how much will my taxes rise? If the project raises her taxes by $100, the price of the project to her is $100. If she perceives that the benefits of the project to her are more than $100 (because her kids or the kids of people who might buy her house get a better education), she will, according to the rational self-interest model of politics, vote for the project. If not, she will vote against it.

The community's property tax *rate* is irrelevant to her thinking. It may be that local officials will explain the project as raising property tax rates by so many mills, but we assume that she translates that into a dollar figure. (In fact, most local officials do the translation when they present the budget: "For an average price house, this proposal will raise taxes by $100.") But it does not matter whether the additional rate is .0001 x $1,000,000 = $100, or .001 x $100,000 = $100. The value of her home (the average-value home in the community) can be a million dollars or only one-tenth of that amount. In order to get the same educational program, the median voter pays the same price for local public services in every community.

Moreover, whatever advantages a large nonresidential tax base confers on residents will be offset by capitalization. Lower taxes and better schools raise housing prices, so those who come after the advantages are put in place will have to pay for their privileges. The full price of public services in such "property rich" communities is the taxes residents pay plus the premium they must pay for their homes. (This was described in the Bow and Concord comparison in the "A Concrete Example of Tax Capitalization" section.) Free lunches are hard to find.

Power equalization undermines the efficiency advantages of the Tiebout model. By pooling all taxable resources into a common statewide base, no individual community has any incentive to improve its own property values by improving the quality of its tax base. In particular, a district that adopts a cost-effective school program should, under a truly decentralized system as described in the "How Capitalization Produces Better Schools" section, be able to reap the gains in property values that such a program creates. But under power equalization, the higher property values will either reduce state aid (which comes from general taxes or from property-rich school districts) or, if the district was "property rich" to begin with, increase the amount of property taxes that are to be "recaptured" and shipped to other districts.

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[77] Coons (1978) makes the argument most clearly, but it was also present in Coons, Clune, and Sugarman (1970).

[78] The advantage of looking at the median voter rather than just asking about the group characteristics of a majority is that most statistics about the populations of local governments are summarized as averages. Thus it is easy to determine what the median family income, median house value, and median age of household adults is, and from this the demographic and economic characteristics of the median voter can be observed. On the empirical validity of this approach, see Robert Inman (1978) and Randy Holcombe (1989), who generally confirm its usefulness. For a more qualified endorsement, see Romer, Rosenthal, and Munley (1992), who see the median voter applying only in smaller school districts.

Full power equalization is essentially like the incentive effects of a 100 percent wealth tax. If all increments to the wealth of individuals were taxed away, most people would expect the amount of wealth creation and maintenance to drop to nearly zero. Once a power equalization system is in place, it would hardly be surprising if support for local property taxes declined and the efficiency of the public schools was reduced.[79]

Once a power equalization system is in place, it would hardly be surprising if support for local property taxes declined and the efficiency of the public schools was reduced.

I have heard *Serrano*-advocates rationalize their tax-base reform with the following argument. Even if the size of the local tax base is a poor basis for redistribution of wealth, court-ordered equalization will inevitably "level up" expenditures. The reason was that the voters in "property rich" places and high-demanders for school expenditures were expected to tax themselves at ever higher rates so as to maintain their own schools. The threat of fouling their own nests was supposed to be the reason that the property rich would continue to lay their golden egg (to mix my avian metaphors).

This was wrong as a matter of both statistical evidence[80] and common experience. Remember when you were caught eating candy in class in grade school? The teacher said, if you are going to eat candy, you have to provide equal amounts to everyone else in the class. The teacher did not expect you to buy a bag of candy for the whole class the next day. His or her intention was to ***discourage*** you from spending any more on candy for anyone. But spending more on schools seems to have been what state supreme courts expected would happen as a result of their Serrano-inspired, share-with-the-whole-state rulings.

All three of the best-known academic advocates of power equalization have, for various reasons, discarded it and gone on instead to endorse other measures to improve schools. Coons and Sugarman (Coons and Sugarman 1978, 1992) now advocate a system of vouchers targeted at low-income children regardless of where they live.[81] This idea is sound as a means of supplementing locally controlled property taxes for education, but it cannot replace them. Unlike funding for local schools, vouchers do not connect the taxes raised to fund them with the property values of most voters, since vouchers can, under most plans, be used anywhere in the state. Capitalization requires local funding for identifiable local schools.

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[79] Husted and Kenny (1997) found that displacing locally generated taxes with statewide taxes has reduced school efficiency. Using a national sample, David Figlio (1998) demonstrates that property tax revolts generally reduce the quality of public education. It may be, as Eric Hanushek (1986) argues, that schools are inefficient spenders of money, but it appears that the disease is not cured by arbitrarily reducing the amount of property tax revenue they get. I should note that Figlio did not address the cause of property tax revolts, nor do I contend that all tax revolts are in response to school finance centralization decisions.

[80] Statistical tests of school aid formulas such as district power equalization and its more moderate cousin, "guaranteed tax base" (which forgoes "recapture") have shown that they tend to equalize tax rates rather than expenditures (Michael Addonizio 1991, Katharine Bradbury 1994, and Richard Murnane 1985). Receiving districts cut rates more than they increased spending, and sending districts reduce spending rather than send their taxes to other districts.

[81] The third musketeer, William Clune (1992), now specifically disowns power equalization, particularly the "horror of recapture," though he continues to urge the courts to involve themselves in what he regards (and I do not) as the different issue of educational adequacy. Another early proponent of power equalization, Mark Yudof (1991b), reflected on Texas's attempt to implement it and concluded that the gap between scholarly theory and practical politics is too wide to bridge.

Conclusion

"Local control" is almost as widely derided by academics[82] as it is embraced by ordinary citizens. Perhaps academics cannot see the virtues of local control because they tend to view local governments, including school districts, as miniature versions of state governments. Because state governments command more resources, more professional expertise, and a wider geographic domain, it would seem to follow that they are always better equipped to deal with any governmental function. I have contended, however, that local governments are different from and, in many important ways, better than state governments in providing services of interest to their residents because of capitalization.

Capitalization connects two things that Americans clearly care a great deal about: the value of their homes and the quality of their children's education. This connection guides them and their elected representatives to pay attention to the quality of education as well as other local services whose benefits improve property values. Most of the court decisions that have overturned property tax financing of education have helped divorce the value of one's home from the quality of schools. (Capitalization occurs much less at the state level because potential residents cannot shop around for states the way they can shop around for communities.) This divorce has most probably contributed to the declining quality of public education and, at least in some states, to a reduction in public support for education as a whole.

As a whole, court-induced centralization of school finance does not meet the most important egalitarian goals. Spending and local tax rates have become somewhat more equal within states as a result of the court decisions, but that is a chimerical gain because of capitalization. Lower tax rates result in higher housing prices, so the overall economic burden does not change. The measurable educational outcomes have either declined or not changed. No social science study persuasively connects the school finance litigation with better outcomes for children from disadvantaged homes.

There is strong evidence from California that the consequence of a highly egalitarian system ordered by the *Serrano* court has made poor children worse off, and there is some circumstantial evidence that court decisions or the threat of such decisions in other states have induced taxpayer revolts that have undermined education for all. At its worst, school finance litigation has engendered dog-in-a-manger equality of low-quality education. At its best, it seems to have done little more than shift tax burdens and property values in ways that offer no systematic benefit to the poor.

It is time for the courts to reconsider the wisdom of these cases.

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[82] Richard Briffault (1992) asserts that local control is unimportant. Christopher Lu (1991) calls local control a "farce." Jack Coons, the godfather of district power equalization, has elsewhere written of what he regards as the "pathetic American system of local non-government" (1974, 305). On the other side, Paul Carrington (1973) worried prophetically about the loss of local control implied by the *Serrano* case.

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Where Does New Money Go? Evidence from Litigation and a Lottery

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Introduction

Voters and policymakers who are interested in improving the quality of the public schools in poor communities through increased spending face a number of difficult challenges. The first and most obvious of these challenges simply involves how new resources can be raised. Over the last 30 years, reformers in almost every state have attempted to compel state governments to play a larger role in financing public education in poor communities by challenging in court the constitutionality of education finance systems based largely on local property wealth. This class of litigation has typically argued that such systems are unconstitutional because, by limiting the educational opportunities of the children in poor communities, they violate the equal protection or education clauses of state constitutions.[1] To date, the supreme courts in 17 states have agreed, invalidating the education finance system and encouraging states to direct new aid to their poorest school districts. However, over this same period, 37 states have also turned to new state lotteries as a way to increase state funding for key services like education. There are several reasons that these popular approaches to reforming education finance might often prove to be ineffective. For example, it is by no means clear that these reforms actually increase educational spending. State legislatures may respond slowly, if at all, to a negative court ruling that encourages increased aid. Furthermore, states that earmark new lottery revenues for education may simply choose to then reduce their education appropriations from other sources. And, even if these reforms do increase state aid, the effect on educational spending may be undone at the district level by reductions in revenues raised from local and Federal sources.[2] Finally, even if new state aid were to increase local educational spending, it is not clear that these new resources would be allocated in ways that actually improved school quality. An extensive empirical literature on educational productivity suggests that there is no systematic relationship between increased school spending and measured school quality (e.g., Burtless 1996). This view, though controversial, raises the critical concern that school districts would not allocate new reform-driven state aid in a productive manner.

This study discusses empirical evidence on these policy-relevant concerns drawn from evaluations of three recent state-level education finance reforms. In 1993, Massachusetts began court-ordered education finance reforms that were designed to increase state aid to public schools, particularly those in the poorest school districts (Dee and

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[1] More recent rulings have emphasized issues of educational adequacy. For an overview of this litigation, see http://nces.ed.gov/edfin/litigation/Contents.asp.

[2] The available evidence indicates that the earliest 11 court-ordered reforms increased state aid per pupil as well as district spending (e.g., Murray, Evans, and Schwab 1998; Evans, Murray, and Schwab 1997; Card and Payne 1998). However, state lotteries have often not increased the overall level of state aid to education (e.g., Clotfelter and Cook 1989; Borg, Mason, and Schapiro 1991; Clotfelter 1994; Spindler 1995).

Levine 2000). In that same year, Tennessee began similar court-ordered reforms while the neighboring state of Georgia initiated a lottery explicitly designed to promote educational spending (Dee 2001). Part of what makes these policy experiments of interest is simply that we would like to know about their narrow consequences for the patterns of educational finance and spending within these three states. However, the experiences with the reforms in these three states may also provide general evidence on important questions of interest to policymakers and voters everywhere. In particular, the effects of these state-specific reforms can suggest how any independent increases in available educational resources are actually spent. Though there are many studies that examine the relevance of resource levels, there is surprisingly little evidence on how school districts actually allocate available resources.[3] Another dimension to these three state reforms that should also make them of more general interest is that each state adopted unique strategies to try to ensure that the new state aid actually improved school quality.

each of these reforms led to increased state aid to poorer school districts . . . the spending effects of this aid were not dramatically offset by reductions in local or Federal revenues.

The available district-level data on per-pupil revenues by source (Federal, state and local) and expenditures by function provide outcome measures that allow us to assess the key consequences of these reforms. These data are drawn from the annual "F-33" Survey of Local Government Finances for the fiscal years before and after each state's 1993 reforms. The F-33 survey identifies district revenues by source and also divides expenditures into six broad categories: instruction, support services, noninstructional services, functions unrelated to elementary and secondary education, capital expenditures, and other expenditures.[4] The preferred research design for evaluating the state reforms exploits the "panel" nature of the available revenue and expenditure data. More specifically, the data from combined, annual F-33 surveys provide observations for the school districts in each "treatment" state (Massachusetts, Tennessee, and Georgia) in years before and after the 1993 reforms as well as contemporaneous observations from school districts in neighboring "control" states (Connecticut, Maine, and South Carolina). This combination of cross-sectional and time-series data allows us to identify the effects of each state policy in regression models that control for the unobserved traits specific to each school district and to each fiscal year. In brief, the results of these evaluations suggest that each of these reforms led to increased state aid to poorer school districts and that the spending effects of this aid were not dramatically offset by reductions in local or Federal revenues. However, these reforms were only moderately successful at targeting the new spending towards the instructional and capital functions for which they were often intended. A comparison of the relative efficacy of these state reforms in promoting specific expenditures suggests that institutional features like district size as well as the novelty and visibility of new reform-related educational initiatives play an important role.

Litigation and Lotteries

Beginning with the influential 1971 *Serrano* decision in California, the supreme courts in 17 states have ruled in favor of the plaintiffs, deeming their states' systems of education finance unconstitutional. Recent empirical evidence suggests that the earliest court-ordered reforms were effective in encouraging states to direct new resources to poorer school districts. For example, in a study based on district-level panel data from the 1972–92 period, Murray, Evans, and Schwab (1998) conclude that the earliest 11 state reforms increased spending in the poorest districts by 11 percent while leaving spending in the wealthiest districts unchanged.[5] However, we know relatively little about the consequences of more recent court rulings like the 1993 court rulings in Massachusetts and Tennessee. In the years prior to Massachusetts' 1993 court ruling in *McDuffy v. Secretary of the Executive Office of Education*, the state undertook several legislative attempts to improve the equity of available educational resources, which were widely viewed as unsuccessful. According to an analysis of data from the 1991–92 school year (General Accounting Office 1997), Massachusetts ranked near the bottom among states in terms of equalization effort and the wealth neutrality of school spending.[6] The court's decision emphasized the state's responsibility in providing for an "adequate" education and made it clear that it understood educational "adequacy" in terms of available financial resources. Shortly afterward, the state enacted the Massachusetts Education Reform Act (MERA), which committed substantial new state resources to public education (Guryan 1999). This legislation also established foundation and "standard-of-effort" levels that would require some school districts to increase local revenues but allow others to reduce theirs. Other features of the legislation did relatively little to target the new state aid towards specific educational programs or functions (notable exceptions included teacher training and pre-K programs for at-risk children). However, the Act did include other reforms intended to ensure that the new state aid improved school quality. These included an increased authority for principals and superintendents in disciplining students and firing teachers, increased parental involvement and the phasing-in of statewide learning and graduation standards and school assessments based on student test performance. Tennessee's 1993 ruling in *Tennessee Small School Systems v. McWherter* helped resolve several years of contradictory lower court rulings and controversial legislative efforts to identify a tax base for new state funding. Like other recent rulings, this decision emphasized the state's role in ensuring the equal availability of a quality education. The state was ultimately allowed to implement a new funding formula that phased in $1 billion of new aid over the next 5 years.[7] Interestingly, the new state aid was bundled with comprehensive educational reforms that attempted to target the new aid largely towards expenditures on student instruction and investments in high-technology "21st-century classrooms." These earmarking efforts included the phasing-in of mandatory class-size reductions and the creation of test-based accountability measures.

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[3] Lankford and Wyckoff (1995) and Rothstein and Miles (1995) provide useful descriptive evidence on how districts allocate resources and how these allocations have changed over time. However, these results do not exactly parallel the thought experiment of interest because the observed changes in available resources are not driven by a plausibly independent policy experiment.

[4] While more detailed data on the allocation of expenditures would have been welcome, this taxonomy still allows us to address some of the broad questions of interest. In particular, these data allow us to assess whether these reforms were effective in increasing spending on targeted functions like student instruction and capital improvements.

[5] There is also evidence linking the resources generated by such reforms to increases in test scores (Card and Payne 1998, Guryan 1999), population mobility (Aaronson 1999) and increases in residential property values and rents (Dee 2000). The six other states where state Supreme Court rulings have recently invalidated the educational finance system include Alabama (1993), Massachusetts (1993), New Hampshire (1993), Ohio (1997), Tennessee (1993), and Vermont (1997).

Over the same period, the state of Georgia pursued an alternative path to increasing state funding of schools—a new state lottery.[8] For most of the 20th century, no state raised revenues by means of a lottery (Clotfelter and Cook 1989). However, since 1964, 37 states have introduced them, often on the basis of claims that lottery revenues would be targeted for elementary and secondary school spending. Critics of the growth in lotteries have pointed to the clear evidence that state-sponsored gaming is a fairly regressive way of raising revenues.[9] Proponents of lotteries have countered that the expenditure of earmarked lottery revenues can attenuate this regressivity. However, this argument depends on the assumption that lotteries actually increase spending on services like education. There is evidence from several states that lottery revenues earmarked for educational expenditures simply crowded out other revenue sources and did not increase overall state aid (e.g., Borg, Mason, and Schapiro 1991; Clotfelter 1994; Spindler 1995). The earmarking of lottery revenues for specific functions like education is more likely to be successful in this regard if the

...since 1964, 37 states have introduced them [lotteries], often on the basis of claims that lottery revenues would be targeted for elementary and secondary school spending.

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[6] The available evidence suggests that legislatively motivated reforms are typically ineffective in the absence of a pejorative court ruling (Evans, Murray, and Schwab 1997). The failure of reforms prior to 1993 may have also reflected the 1981 passage of Proposition 2½, which lowered local property taxes and placed restrictions on their future growth.

[7] The money for these increases came largely from a 1992 half-cent increase in the state sales tax. The impending court ruling was widely understood as the underlying (and independent) impetus for Tennessee's education finance reforms, which began to take effect in fiscal 1993. However, a mild caveat is nonetheless appropriate since the 1992 sales tax increase that funded the reforms actually preceded the court's ruling.

[8] A 1981 decision by the Georgia State Supreme Court found that their system of education finance was constitutional.

[9] See Clotfelter and Cook (1989) and Price and Novak (1999) for evidence of regressivity. The implicit tax on lottery purchases has also been criticized because it is targeted towards minorities and those with low educational attainment.

new appropriations are large relative to prior expenditures and if they are linked to new and highly visible initiatives (Clotfelter and Cook 1989). The design of Georgia's lottery provides a particularly interesting opportunity to evaluate that claim. The improbable adoption of a state lottery in Georgia was driven largely by the zeal of then-Governor Zell Miller and culminated in the 1992 approval of a voter referendum sanctioning lottery operations. The popularity of the lottery was partly rooted in its stated purpose was to provide funds for new educational initiatives in three highly visible areas: postsecondary HOPE Scholarships, pre-kindergarten programs for four-year-old children, and equipment and capital investments in public schools. The early lottery sales were surprisingly strong and over the 1994 and 1995 fiscal years, the state of Georgia allocated roughly $115 million of lottery revenues for pre-K programs, $309 million for technological investments in schools and $168 million for school construction (Byron and Henry 1999).

. . . the results reported here are based only on the poorest districts within each state since they are most likely to be influenced by these reforms and are of particular interest from a policy perspective.

Data and Methods

The empirical results discussed here are based on district-level data from the annual "F-33" Survey of Local Government Finances. The U.S. Department of Education's National Center for Education Statistics (NCES) sponsors the survey in conjunction with the Government Division of the U.S. Bureau of the Census. The F-33 survey is an annual questionnaire that gathers financial data from school districts on the sources of their revenues (Federal, state, and local) as well as data on the functional areas to which they allocated these resources (Dee, Evans, and Murray 1999). The evaluations of Massachusetts' reforms are based on F-33 data from the 1990, 1992, 1994, 1995, and 1996 fiscal years (Dee and Levine 2000). This data set includes contemporaneous data from the neighboring states, Connecticut and Maine. The evaluations of Tennessee's and Georgia's reforms are based on similar F-33 data and include contemporaneous data from South Carolina. But this data set excludes data from the 1996 fiscal year because of an idiosyncratic shock to South Carolina's state aid for that year (Dee 2001). As in most prior studies (e.g., Evans, Murray, and Schwab 1997), the data sets were also limited to unified school districts, which are more homogeneous in scale and organizational goals. Following the procedures recommended by O'Leary and Moskowitz (1997), these extracts were also examined for the existence of special, nonoperating and administrative districts, which were then eliminated. Additionally, the results reported here are based only on the poorest districts within each state since they are most likely to be influenced by these reforms and are of particular interest from a policy perspective. The poorest districts within each state were identified as those in the bottom third of the 1990 state-specific distribution of per-pupil revenues raised locally.

Table 1 presents, for each of the two data sets, key descriptive statistics for the revenue and expenditure outcomes.[10] The revenue data identify the real, per-pupil financial backing from three general sources: Federal, state and local. Relative to school districts in the three New England states, those in the Southern states have less total revenue and raise a smaller share of those revenues from local sources. The F-33 survey divides district expenditures into six major categories (Fowler 1997). Interestingly, the patterns of resource allocation across these categories are quite similar in both regions. Instructional expenditure per pupil, accounting for more than one-half of the total, is the largest of the six categories (table 1). These expenditures apply to "activities dealing directly with the interaction between teachers and students," including not only teacher activity but also the services of teacher aides and other classroom assistants and textbook purchases (Fowler 1997). Support services (26 to 28 percent of total expenditures) constitute the second largest educational expenditure category. Such services are defined as "administrative, technical (such as guidance and health) and logistical support to facilitate and enhance instruction" (Fowler 1997). More specifically, this category encompasses a diverse list of support programs such as social work, attendance accounting, psychological and health services, teacher training, plant operation and maintenance, student transportation as well as school and general administration. The next largest category involves capital expenditures, which includes

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[10] All of the financial data were converted to 1996 dollars using the Consumer Price Index.

Table 1.—Descriptive statistics on revenues, by source and expenditures by function

	Georgia, South Carolina, and Tennessee		Connecticut, Maine, and Massachusetts	
Variable	Mean	Percent of total	Mean	Percent of total
Total revenues per pupil	**$4,523**	**100**	**$7,115**	**100**
State revenues per pupil	$2,920	65	$3,787	53
Federal revenues per pupil	$559	12	$388	5
Local revenues per pupil	$1,045	23	$2,940	41
Total general expenditures per pupil	**$4,589**	**100**	**$6,961**	**100**
Instructional expenditures per pupil	$2,505	55	$3,968	57
Support service expenditures per pupil	$1,175	26	$1,927	28
Noninstructional expenditures per pupil	$328	7	$258	4
Non-el/sec expenditures per pupil	$52	1	$68	1
Capital expenditures per pupil	$469	10	$346	5
Other LEA expenditures per pupil	$59	1	$395	6
Sample size	508		639	

NOTE: All expenditure and revenue data are unweighted and in real 1996 dollars and are from unified school districts in the bottom one-third of their 1990 state distribution of local per-pupil revenues. The data for Georgia, South Carolina, and Tennessee are from the F-33 surveys for the 1990, 1992, 1994, and 1995 fiscal years. The data for Connecticut, Massachusetts, and Maine also include F-33 data for the 1996 fiscal year. The expenditure and share statistics may not sum to 100 due to rounding.

SOURCE: Author's calculations based on F-33 surveys.

school construction, instructional equipment, and land purchases. Expenditures on noninstructional functions include food services and business-like enterprise operations such as bookstores. The non-elementary/secondary category includes expenditures on adult education and various community services (e.g., swimming pools and child care). The final expenditure category includes other district expenditures such as payments directed to state and local governments, payments to other school systems and interest on debt.

The effects of the three state reforms were identified with these two data sets by estimating multiple regression models that exploit the panel nature of the available district-level information (see Dee and Levine 2000 and Dee 2001, for details). The basic logic (and implicit assumptions) of this methodological approach can be clearly illustrated by considering the trend data on real, per-pupil state revenues in figures 1 and 2. For example, the data in figure 1 indicate that real per-pupil state aid in Tennessee and Georgia increased following their 1993 reforms. However, these time-series "differences" include the true effects of each reform as well as the confounding influence of everything else that were also changing over the same time period. In particular, it is unclear whether this growth in state aid was attributable to the reforms or merely to the region's simultaneous recovery from earlier recession-related declines. Fortunately, the contemporaneous "difference" from districts in the "control" state, South Carolina, allow us to assess that possibility. More specifically, the "difference-in-differences" can isolate the portion of each state's post-reform state-aid changes that is due to the reforms alone (Meyer 1995). The data from figure 1 suggest that both reforms did increase state aid: the post-reform growth in each state's aid outstripped the contemporaneous changes in South Carolina. Similarly, in figure 2, we see that, after 1993, state aid to the school districts in Massachusetts was generally higher, particularly in 1996. And, since this growth generally exceeded the contemporaneous changes in the two neighboring states, we may attribute much of this growth to the effects of their state-specific reforms. This approach to policy evaluation relies critically on the implicit assumptions that each of the state reforms was independently given and that the data from the "control" states provide valid controls for the shared time-series variation in revenue and expenditure outcomes that is unrelated to the state reforms. A variety of anecdotal and empirical evidence supports these maintained assumptions (Dee and Levine 2000, Dee 2001). For example, Connecticut and Maine were the only states bordering Massachusetts that did not also experience major educa-

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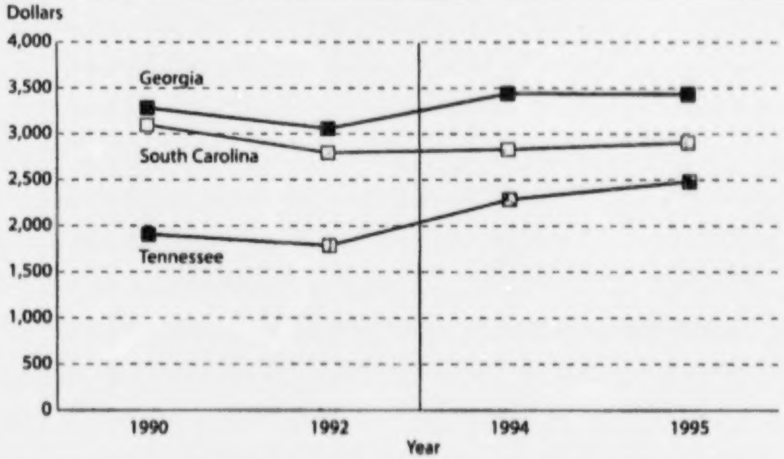
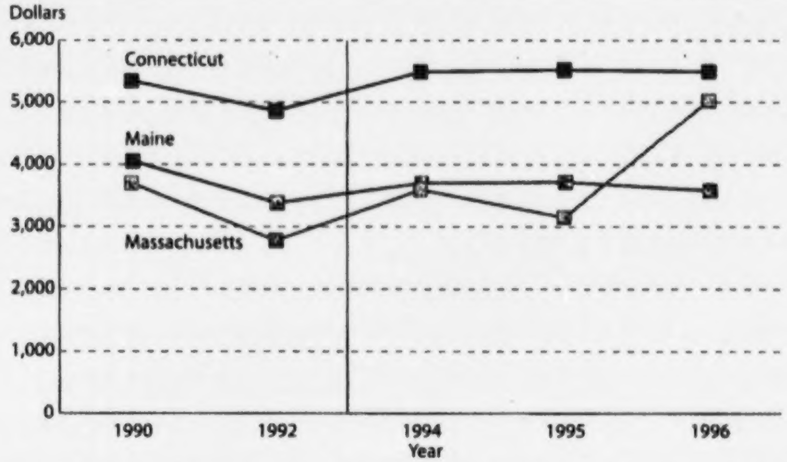
Figure 1.—District-level state revenues per pupil in Georgia, South Carolina, and Tennessee, 1990–95 fiscal years



NOTE: Data are weighted by student membership and are from unified school districts in the bottom one-third of their 1990 state distribution of local per-pupil revenues.

SOURCE: F-33 surveys for each fiscal year.

Figure 2.—District-level state revenues per pupil in Connecticut, Maine, and Massachusetts, 1990–96 fiscal years



NOTE: Data are weighted by student membership and are from unified school districts in the bottom one-third of their 1990 state distribution of local per-pupil revenues.

SOURCE: F-33 surveys for each fiscal year.

tion finance reforms over this period.[11] Similarly, South Carolina experienced major finance reforms well before the study period and had its new system validated in a 1988 court decision. The state-specific trend data in figures 1 and 2 also suggest the validity of these control states. In the two observed years prior to 1993, the changes in state aid across treatment and control states tracked each other quite well.

Results

Table 2 presents the regression estimates that indicate how each state's education finance reforms influenced the patterns of per-pupil revenues by source within the poorest school districts of each reform state. Like the graphical evidence from figures 1 and 2, these estimates suggest that each of these reforms had, in an immediate sense, their intended effect: increased state aid to schools. Court-ordered reforms in Massachusetts and Tennessee were associated with statistically significant increases in per-pupil revenues from the state of $659 to $682. Georgia's lottery increased per-pupil state aid to these districts by an estimated $542. The success of Georgia's lottery in targeting most of the new aid to its poorest school districts suggests that the regressivity of the lottery's implicit taxation was attenuated by how these funds were distributed (Dee 2001). But there is also evidence that the spending effect of each state's new aid was somewhat undone by reductions in revenues raised from other sources, particularly local ones. However, the small size of the data set and the magnitudes of these estimated effects imply that these reductions are imprecisely estimated and often statistically indistinguishable from zero. While the apparent reductions in local and Federal revenues were not trivial, they were too small to negate the overall spending effect of each state's reforms.

However, the impact of these reforms should also be judged by how these new resources were actually spent. In particular, the rhetoric surrounding these reforms often suggested that the new state aid would often be targeted towards instructional functions and important capital needs such as facilities and new instructional equipment. Table 3 presents estimates that indicate how these reforms influenced total expenditures as well as those in each of the six functional categories. One interesting feature of these results is that the total expenditure effects differ from the estimated effects on revenues in table 2. These differences appear to reflect certain behavioral responses as well as accounting features of the data. For example, the relatively small reform-driven increases in total expenditures in Georgia and Tennessee are partly due to districts using their new aid to substantially reduce their outstanding debt holdings (Dee 2001). Furthermore, the relatively large reform-driven increase in district expenditures in Massachusetts could reflect the F-33's accounting practice of identifying the total value of long-lived capital projects in the current fiscal year. The short-term spending effect in many of these districts

Table 2.—Estimated changes in per-pupil revenues, by source due to state-specific education finance reforms

Dependent variable	Lottery—GA	Court-ordered reform—TN	Court-ordered reform—MA
Total revenue per pupil	[1]430	[1]550	[1]547
State revenue per pupil	[1]542	[1]682	[1]659
Federal revenue per pupil	-27	-38	37
Local revenue per pupil	[3]-85	-93	-150

[1] Statistically significant at 1-percent level.
[2] Statistically significant at 5-percent level.
[3] Statistically significant at 10-percent level.

NOTE: These estimates are based on multiple regression models that include state and year fixed and the state unemployment rate and data for unified school districts that were in the bottom one-third of their 1990 state distribution of local per-pupil revenues. See Dee (2001) and Dee and Levine (2000) for details.

SOURCE: Dee, Thomas S. and Levine, Jeffrey. 2000. *The Fate of New Funding: Evidence From Massachusetts Education Finance Reforms.* Department of Economics, Swarthmore College.

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[11] Connecticut had court-ordered reforms in 1977. Its system of education finance was deemed constitutional both in 1982 and 1985. Maine's system of education finance was also deemed constitutional in 1995.

Table 3.—Estimated changes in per-pupil expenditures, by function due to state-specific education finance reforms

Dependent variable	Lottery—GA	Court-ordered reform—TN	Court-ordered reform—MA
Total general expenditures per pupil	**[3]312**	**167**	**[1]1,555**
Instructional expenditures per pupil	[1]229	[1]154	[1]728
Support service expenditures per pupil	-31	[1]174	[2]209
Noninstructional expenditures per pupil	[1]117	[1]83	[1]-98
Non-el/sec expenditures per pupil	2	18	[1]-85
Capital expenditures per pupil	-6	-124	[1]502
Other LEA expenditures per pupil	[1]-61	[1]-103	[1]299

[1] Statistically significant at 1-percent level.
[2] Statistically significant at 5-percent level.
[3] Statistically significant at 10-percent level.

NOTE: These estimates are based on multiple regression models that include state and year fixed and the state unemployment rate and on data for the unified school districts that were in the bottom one-third of their 1990 state distribution of local per-pupil revenues. See Dee (2001) and Dee and Levine (2000) for details.

SOURCE: Dee, Thomas S. 2001. *Lotteries, Litigation and Education Finance*. Department of Economics, Swarthmore College.

also appears to have been amplified by reductions in available cash reserves (Dee and Levine 2000).

The remaining results in table 3 provide evidence on how the availability of reform-driven resources influenced spending on specific functions and capital projects. In particular, these results indicate that roughly 53 percent of the new lottery-based revenue in Georgia was allocated directly towards student instruction (i.e., $229 of the $430 increase in per-pupil revenues). In Tennessee, 28 percent of new per-pupil revenues were spent on student instruction, a statistically significant increase of $154 per pupil. While these results suggest that the earmarking of new state aid was somewhat successful (particularly in Georgia), it should also be noted that, on average, 55 percent of spending was on instruction in these districts (table 1). Given that districts have already covered most fixed costs, we might have expected a larger-than-average share of marginal aid dollars to be spent on instruction. However, that was apparently not the case. The relative effectiveness of Georgia's lottery in promoting instructional expenditures could reflect the fact that the lottery was linked to a new and highly-visible initiative, pre-K programs. By contrast, in Tennessee, the new state aid was combined with test-based accountability measures and class-size mandates that were not yet binding. The results in table 3 indicate that these earmarking measures were relatively ineffective over the near term in promoting instructional expenditures.

The estimates in table 3 also suggest that neither Georgia nor Tennessee's reforms had the intended consequence of promoting significant increases in capital expenditures. However, a caveat is appropriate since this aggregate expenditure measure may obscure the targeted effects of the reform-driven spending. In fact, empirical models based on more detailed data from the 1992, 1994, and 1995 fiscal years indicate that the lottery did lead to statistically significant increases in expenditures on instructional equipment in both states (roughly $47 per pupil in Georgia and $98 per pupil in Tennessee). However, neither policy led to statistically significant changes in land or construction expenditures. These remaining results in table 3 indicate that a substantial amount of the new aid distributed by both states led to increased spending in functional areas that were not necessarily targeted. For example, in Tennessee, the new state aid created by court-ordered finance reforms led to statistically significant increases in spending on various support services ($174 per pupil) and on noninstructional functions ($83). Similarly, in Georgia, the availability of new lottery-based state aid increased expenditures on noninstructional functions by a statistically significant $117. However, neither policy appeared to influence district expenditures on activities unrelated to elementary and secondary education. In assessing the results for these two states, it is of course difficult to conclude whether the new educational resources created by the state-specific finance reforms did or did not increase school quality. But these results do suggest that these reforms were at best only moderately successful in promoting targeted expenditures on instruction and capital improvements. However, some qualifications are appropriate. For example, the sharp increase in expenditures on support services in Tennessee is likely to reflect in part the costs of training teachers to use new high-technology classroom equipment. In Georgia, the operation of new pre-K programs should reasonably increase some noninstructional expenses (e.g., food services). Nonetheless, the magnitudes of the increases in support and noninstructional services appear to be too large to reflect only these possible explanations (Dee 2001).

The results in the last column of table 3 are based on data from Connecticut, Maine, and Massachusetts. These estimates suggest that Massachusetts' reforms were particularly successful in promoting expenditures on student instruction and capital projects. Over the near term covered by this data set, the finance reforms increased instructional spending by a statistically significant $728 per pupil and capital expenditures by $502 per pupil.[12] In fact, the increased spending in these areas and on support services was magnified by apparent reductions in spending on noninstructional activities and activities unrelated to elementary and secondary education. The comparative success of Massachusetts' reforms in promoting expenditures on instruction and capital projects is somewhat surprising since they made relatively little effort to target these functions. The state of Tennessee was arguably more aggressive in targeting instructional and capital needs but less successful in actually increasing district spending on these functions. These differences may reflect other policy changes as well as institutional differences across these states. For example, Massachusetts' simultaneous efforts to decentralize decision-making authority and increase parental involvement may have influenced the allocation of new resources. These data also indicate that the student enrollments in Georgia and Tennessee's districts are roughly 70 percent larger than in Massachusetts. The smaller size of the districts in Massachusetts may have also encouraged increased voter and parental monitoring that influenced the allocation of the new, reform-driven resources.

Conclusions

Every state has an established constitutional commitment to a free public education. These state provisions reflect the widely accepted importance of learning for both individual and civic welfare. The financing of this public commitment relies on varied patterns of support from all levels of government. However, the practical relevance of the educational resources raised from local sources has contributed to what are widely perceived to be substantive resource inequities across local school districts. Over the last 30 years, reformers in almost every state have pressed litigation that attempts to rectify these inequities by encouraging their states to increase their financial aid to poor school districts. Most states have also introduced lotteries over this period as a general way to raise new revenues for important functions like education. However, the probable efficacy of such efforts in promoting equitable access to educational opportunity is clearly an empirical question. Compensating budgetary responses at the state or local level may undo efforts to promote educational spending through increased state aid. And, if new aid were to promote increased spending, it is unclear whether these new resources would be allocated in ways that actually improved school quality. This paper discussed empirical evidence on these critical issues drawn from evaluations of the recent reforms in Massachusetts, Georgia, and Tennessee. The empirical evidence from the court-ordered education finance reforms in Massachusetts and in Tennessee indicates that litigation can be an effective tool for increasing educational aid and spending in the poorest school districts. This evidence also indicated that the early experience with lottery-funded spending in Georgia generated similar results. The success of Georgia's lottery in promoting spending by the state's poorest school districts implies that the much-criticized regressivity of lotteries was attenuated in this instance. Though all of these finance reforms increased educational spending, they had varying degrees of success in promoting targeted expenditures. The comparative success of each state in promoting specific expenditures suggests that they were most successful when the new state aid was linked to new and highly visible educational initiatives and when there were institutional features that promoted local control and parental involvement.

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[12] Regarding the sizable increase in capital expenditures, it should be recalled that this reflects the full expensing of long-lived assets. The increase in "other" expenditures ($299) is also consistent with increased capital expenditures since that category includes interest payments.

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